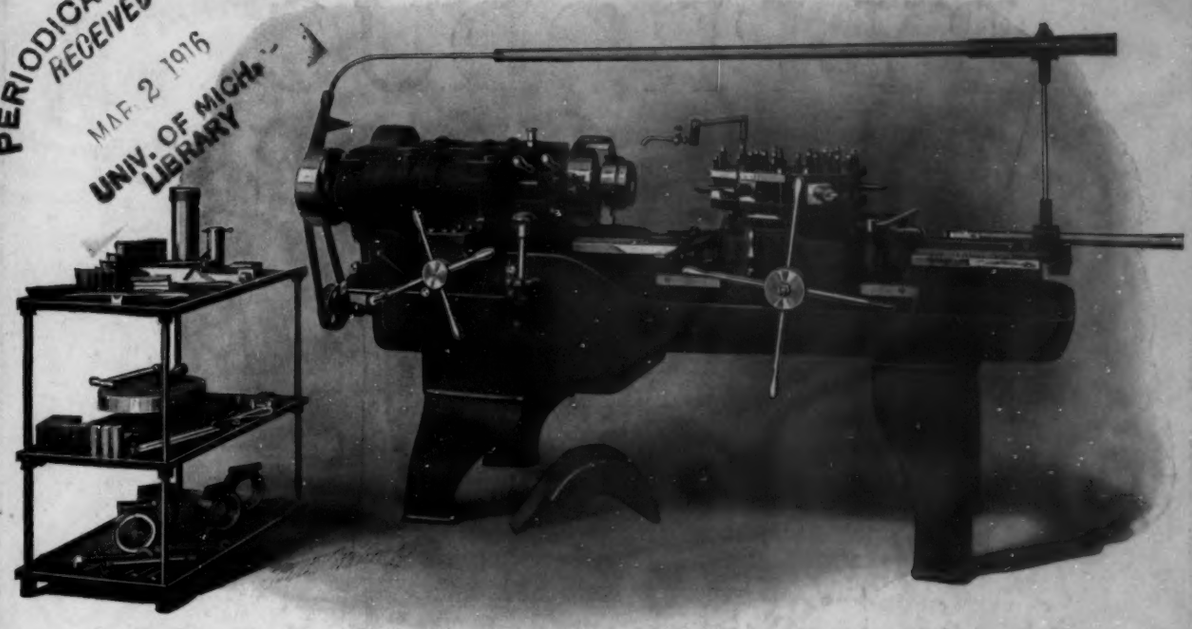
MACHINERY ISSUE

THE IRON TRADE REVIEW

Single Copies 15 Cents | CLEVELAND, MARCH 2, 1916 | Four Dollars a Year

PERIODICAL ROOM
RECEIVED
MAR 2 1916
UNIV. OF MICH.
LIBRARY



Mobilized for Service

THE HARTNESS FLAT TURRET LATHE with combination bar and chucking outfit is ready at a moment's notice for any ordinary lathe job within its range. Whether shafts, studs, bolts, gear blanks, pulleys, or miscellaneous castings for forgings, it matters not.

No special fixtures, no attachments, nothing but regular equipment for regular work. Turret Lathe speed and engine lathe accuracy. Send for the Manual.

Jones & Lamson Machine Company

Springfield, Vermont, U. S. A. — 97 Queen Victoria Street, London

Alphabetical list of Advertisers, page 129. | Table of Contents, page 55. | "Where-to-Buy," page 132.
Opportunities, pages 120-121. | Second-Hand Machinery, pages 122-123. | Fill-in and Contract Work, page 125
Manufacturing Sites, page 126. | Engineering Directory, page 174.

KOPPERS

BY-PRODUCT COKE OVENS

¶The Seaboard By-Product Coke Company has awarded to H. Koppers Company a contract for a by-product coke plant of 110 ovens to be built at Jersey City, New Jersey.

KOPPERS COKE

H. KOPPERS COMPANY

PITTSBURGH, PA.

Say you saw it in THE IRON TRADE REVIEW

THE IRON TRADE REVIEW

Vol. LVIII Cleveland, March 2, 1916 No. 9

Very Heavy Selling for Next Year

Railroads Place Rail Orders for 1917 Delivery—Large Tonnages of Ship Steel Sold —Great Activity in Pig Iron at Pittsburgh and Cleveland

DRIVING of blast furnaces to produce the greatest possible output will cause the blowing-out of a number of stacks at an early date. One Detroit furnace will be out for two months for relining and other stacks will soon be on the inactive list while repairs are being made. The large furnace capacity of the Jones & Laughlin Steel Co. has not proved sufficient to meet its own needs and it has purchased about 50,000 tons of basic at around $18, valley. The market is extremely active at Cleveland, where inquiries for from 50,000 to 60,000 tons of various grades are pending. In New England, deliveries are being greatly delayed by railroad embargoes.

Leading steelmakers in the east have sold 110,000 tons of steel for ships for delivery in the second quarter of next year at 2.50c, Pittsburgh, for plates; 2.35c for shapes, and 2.30c for bars. This material is for about 20 vessels recently placed with various yards, principally for foreign interests. Some contracts for steel bars have been made with agricultural implement makers at 1.90c, Pittsburgh, for delivery up to Jan. 1, but some mills are declining to contract at less than 2.25c. Recent purchases of steel scrap by Steel Corporation subsidiaries in Chicago and Pittsburgh have amounted to about 100,000 tons.

Shapes

While in the east structural contracts have been more numerous since the $5 advance was announced, this is not true in the central west and there are indications that the erection of some office buildings and other structures will be delayed on account of the high prices prevailing.

Railroad Buying

A very unusual proceeding is the negotiation by railroads for steel rails for 1917 delivery, which so far has resulted in the placing by three companies of a total of 70,000 tons. Seldom, if ever, have railroads closed for rails so far in advance. The Southern railway has increased its order with the Tennessee company to 30,000 tons and scattering orders total 17,000 tons. The Bessemer & Lake Erie has ordered 2,500 hoppers and gondolas. Car buying is more lively and inquiries for from 10,000 to 15,000 are pending. February, however, made a poor showing, the total being only 11,000 tons, as compared with 21,700 in January. Rail buying was also light last month, the total being only 110,000, as compared with 200,000 in January. Many orders for locomotives are being placed.

Price Advances

Tin plate prices are very strong and 25 cents above the $4 per base box price is freely paid on domestic business, with considerably higher prices on export. Nuts, bolts and rivets are very strong at the recent advance and another advance is expected at an early date. Wire has again been marked up $2. Pipe has been advanced $2 on standard black and $4 on galvanized. Of plates, a western Pennsylvania maker sold 600 tons for delivery in the Chicago district at 3.50c, mill, and a carload for prompt delivery was sold at 5c. For fairly prompt delivery, Cleveland mills are freely selling at 3c, Pittsburgh.

Ferro Manganese

An interesting development in the ferro-manganese market is a contract which has been made by the Miami Products Co., Chicago, by which one of the stacks of the Iroquois Iron Co., at South Chicago, will be used for the making of ferro-manganese, spiegeleisen and other ferro-alloys. It is expected that manganese ores from southern California will be utilized at first, and later ores may be imported from Brazil. Demand for ferro-manganese continues far in excess of the supply.

Warehouse Business

Warehouse prices have again been advanced $3 per ton at Cincinnati and Chicago and advances are expected at Cleveland within a few days. Warehouse business continues very strong and some jobbers report that in February they did the largest amount of business ever transacted.

MEN OF MACHINERY TRADE

Who they are **Where they are** **What they are doing**

BENTON HOPKINS sailed for Europe Feb. 22 on the Norwegian American liner BERGENSFJORD as the representative of the Morgan Engineering Co., Alliance, O., and the Samuel Austin & Son Co., Cleveland. Mr. Hopkins is going to Russia to open the way for the construction of a string of automobile plants in the Czar's domains. It is said that the plant immediately under consideration is the first one of a group of 27 large establishments which are to be erected in Russia as a part of the great movement for the industrial development of the great eastern empire. A group of influential Russian people are behind the project.

Bernard Lester has been appointed manager of the small-motor section of the industrial department of the Westinghouse Electric & Mfg. Co.

Alfred P. Mello, formerly of the Westinghouse Co., Springfield, Mass., has been appointed chief engineer and superintendent of the Davis Arms Co., Boston.

Frank C. Clark, superintendent of the Pacific locks, Panama canal, at Pedro Miguel, Canal Zone, has accepted a position with the New Castle Construction Co., New Castle, Del., as superintendent.

Le Roy Hilyard has entered the employ of Edward G. Budd Mfg. Co., Philadelphia, as assistant engineer. He was until recently affiliated with the International Steam Pump Co., Philadelphia.

William A. Cowell, formerly designer and checker with the McIntosh & Seymour Corporation, Auburn, N. Y., has accepted the position of chief draftsman with the William Tod Co., Youngstown, O.

William J. A. London has accepted a position with the Sterling Blower Co., Hartford, Conn., in the capacity of works manager. He was until recently chief engineer of the Terry Steam Turbine Co., Hartford.

George W. Bissell, dean of engineering of Michigan Agricultural College, East Lansing, Mich., was elected president of the Michigan Engineering Society at its recent convention in Grand Rapids.

Charles E. Thomas will take an active part in the sales department of the Hilles & Jones Co., Wilmington, Del. For a few years, Mr. Thomas has lived in the south. Prior to that time, he was general manager and treasurer of the Cleveland Punch & Shear Works Co., Cleveland. He has a thorough knowledge of metal fabricating tools.

John L. Harper, chief engineer for the Hydraulic Power Co., Inc., Niagara Falls, N. Y., has been appointed supervising engineer of the Niagara Falls grade crossings commission.

Otto S. Beyer Jr., formerly general foreman of the Rock Island Lines at Horton, Kan., has become associated with the University of Illinois, Urbana, Ill., in the railway engineering department.

Athur F. Murray has become affiliated with the New England Westinghouse Co., Springfield, Mass. He was until recently equipment engineer of the Blake & Knowles Steam Pump Works, East Cambridge, Mass.

John E. Taylor, until recently associated with the New York Central & Hudson River Railroad Co., Canastota, N. Y., has become identified with the Locomotive Superheater Co., New York, as draftsman.

R. E. Ross was recently elected president of the Hyde Windlass Co., Bath, Me. Only 26 years of age, he is probably one of the youngest executives of large manufacturing companies in the United States.

H. S. Williams, for several years connected with the Aluminum Castings Co., Cleveland, now is purchasing agent for the Pittsburgh Model Engine Co., Pittsburgh. Mr. Williams is well known throughout the machinery trade in the central west.

W. W. Peacock, who was formerly in charge of the Pittsburgh office of Van Dyck, Churchill & Co., New York, now is associated with the Motch & Merryweather Machinery Co., with offices in the Farmers' Bank building, Pittsburgh.

L. W. Coppack has been made sales manager for the Plunk Flexible Shaft Machine Co., of Grand Rapids, Mich. Mr. Coppack will travel extensively in the interests of the company, selling flexible shafts and universal joints.

C. E. Ingalls, formerly identified with the Crocker-Wheeler Co., Ampere, N. J., at Los Angeles, Cal., has been transferred to the Pittsburgh office of that concern, to fill a vacancy caused by the recent resignation of F. J. Brittingham, who has accepted a position as district manager of the Cleveland Crane & Engineering Co., Wickliffe, O., with offices in the First National Bank building, Pittsburgh.

Martin G. Sperzel has resigned his position as sales engineer for the Standard Roller Bearing Co., Philadelphia, Pa., and has taken a similar position with the Royersford Foundry & Machine Co., 54 N. Fifth street, Philadelphia, Pa.

E. E. Kramer, formerly associated with Heyl & Patterson, Pittsburgh, is now president of the National Steel Casting Co., New Cumberland, W. Va., which is building a new plant, including a foundry and machine shop.

Leslie B. Stauffer was elected secretary of the Warner & Swasey Co., Cleveland, at the recent annual meeting of the stockholders. Mr. Stauffer, who has been with the company 17 years, started as a clerk in the factory. He succeeds Frank A. Scott, who has been made vice president.

Paul M. Lincoln, whose connection with the Westinghouse companies in their operating and engineering activities dates back for over 23 years, has become associated with the sales organization of the Westinghouse Electric & Mfg. Co., with the title of commercial engineer.

John Stevenson Jr. has been elected chairman of the Driggs-Seabury Ordnance Corporation, Sharon, Pa. Other officers follow: President, A. E. Borie; W. L. Wright, vice president; Nat Taylor Jr., treasurer; H. H. Meyers, assistant treasurer, and S. B. Pratt, secretary.

Thomas H. Carlin, until recently identified with the Pittsburgh Screw & Bolt Co., Pittsburgh, now is associated with the Motch & Merryweather Machinery Co., Cleveland, in the Pittsburgh district. E. C. Bachelor is in charge of the Pittsburgh offices, located in the Farmers' Bank building.

E. H. Metcalf, formerly factory manager of the Peerless Motor Car Co., Cleveland, now is occupying a similar position for the Pittsburgh Model Engine Co., Pittsburgh, with works in the Homewood district. The Pittsburgh company, which was acquired by the Standard Steel Car Works, a short time ago, recently doubled its capacity.

To the Four Corners of the Earth

A Broad Export and Domestic Demand for American Machine Tools Developed in February—Big Sales to South America

THE machine tool market during February was characterized by a steady demand from practically all lines of domestic industry. The export demand was fair, but did not compare in volume with the records of previous months and the machines purchased were of a more special character; for instance, a large percentage of the buying for export to England and France involved large-swing lathes. Export business in miscellaneous machines, however, would have been large had the buyers been able to obtain reasonable deliveries; a great many inquiries were not quoted on because of the sold-up condition of the market. Toward the close of the month, there was much interest aroused by inquiries for large numbers of 36-inch and other large-swing lathes for making 9.2-inch and 12-inch shells; these were issued by the Westinghouse interests; the General Electric Co., the Crucible Steel Co. of America and other concerns, which are negotiating with one of the belligerent powers on large new contracts, involving shells of these diameters. The lathe inquiries put out by these concerns involve the earliest delivery obtainable, which in most cases is July and August, although limited numbers can be delivered prior to that time. The month was featured by further active demand from domestic munition makers, who continue to pick up tools that are available for early delivery.

Prices Go Up Another Notch

FURTHER price advances were announced during the first 10 days of the month by a number of manufacturers of machine tools and these advances were followed by other makers, so that the level of prices generally is about 10 per cent higher than in January. Prices now may be said to be approximately 25 to 50 per cent higher than they were a year ago. As has been reported previously, a number of manufacturers of milling machines and other tools for some time have not been quoting prices, due to the fact that the deliveries they had to offer ranged all the way from nine to 15 months ahead. These interests have been taking business for future shipment without naming a price, the customer agreeing to pay the figures which shall be in effect at the time of delivery; this policy continues to be followed by these concerns. This policy also has been followed by makers of chucks and other makers of equipment for use in connection with machine tools.

Considerable business already has been entered for shipment to domestic plants in the early part of 1917. As a rule, however, the domestic users continue anxious to secure the earliest delivery possible. This especially is the case with the automobile makers, who placed large orders in February, offering in numerous cases to pay bonuses on machine tools delivered in 1916. In addition to the demand from makers of automobiles and automobile accessories, good orders were placed by concerns in many other lines of industry. Most of this business was of a scattered and small-lot character, but it was of large proportions in the aggregate. This demand is characterized by the experience of a dealer in Chicago, who in February sold eight machines, in a single day, to a car builder, a meat packer, a sugar machinery manufacturer, a toolmaker, a gear cutting plant, an engine builder, an ordnance company and a metal furniture manufacturer.

Heavy Domestic Purchases

THE Pittsburgh Model Engine Co., Pittsburgh, purchased more than 100 machines during February. The Alaskan Engineering Commission, Seattle, took bids on an extensive list of equipment for use in connection with the government railroad which is under construction in Alaska. The Baltimore Dry Dock & Ship Building Co., Baltimore, made large additional purchases of punching and shearing machinery. The American Steel & Wire Co., the Carnegie Steel Co. and other steelmakers put out good-sized inquiries. A steady demand came from mining companies such as the Chino Copper Co., the Anaconda Copper Mining Co. and others. The Braden Copper Co., the Bethlehem-Chile Iron Mines Co., and the Chile Exploration Co., New York, began letting contracts for large quantities of equipment for installation at their properties in Chile. The Wagner Electric Co., St. Louis, the Pouvailsmith Corporation, Poughkeepsie, N. Y., the Cleveland Automatic Machine Co., Cleveland, and other concerns, were good buyers.

Railroads Show Interest

THE railroads issued a large number of inquiries and the end of the month found these interests with important machine tool purchases pending. One of the largest lists was that put out by the Seaboard Air line, on which bids were taken Feb. 28; this involved 17 heavy railroad tools, wanted for installation at various points along the company's lines. The Pennsylvania, the New York Central, the Lehigh Valley, the Western Pacific, the Newburgh & South Shore, the Lake Shore & Michigan Southern, the Midland Central and other roads put out good-sized inquiries. A noteworthy feature of railroad business at present is that these interests instead of putting out extensive lists, as has been their custom in the past, now are taking figures on smaller lists, which they are anxious to close without delay. Among the railroads which placed orders of considerable size were the Baltimore & Ohio, the Southern Pacific, the Santa Fe, the Pennsylvania and the Lehigh Valley.

One of the most important developments in the market during the past month was the award of a huge contract, involving the buildings and complete equipment for large new railroad shops to be built in Chile along the lines of the Chilean state railways. This contract was let in its entirety to a leading American machine tool house having headquarters in New York. While details were not announced, it is believed from the point of view of the outlay involved, that this is the largest contract of its kind ever booked in this country for shipment abroad. The award was no surprise, since the negotiations leading to the settlement of this business had been carried on over a period of approximately two years. A large part of the work involved, such as the erection of the buildings, is expected to be let to other American concerns.

Buy Rails for Next Year

Railroads Looking to the Future—Buying of Cars is More Lively—Many Locomotives Ordered

New York, March 1. (By wire.)—Negotiations by railroads for 1917 delivery have resulted in the placing by three roads of a total of 70,000 tons for that period. The Southern railroad increases its order with the Tennessee company for fourth quarter to 30,000 tons. Scattered orders this week total 17,000 tons.

The Bessemer & Lake Erie car orders are for 2,500 hoppers and gondolas. As divided, the company gives 750 each to the Pressed Steel Car Co. and the Standard Steel Car Co and 500 each to the Ralston and American companies. The North-Western has closed for 1,000 automobile and 500 stock cars.

The Steel Corporation authorizes proceeding with the building of the bridge over the Allegheny for the Bessemer & Lake Erie requiring 14,000 tons.

There is considerable buying of rails by domestic roads to fill out their requirements for this year. The mills, generally, are not able to ship before the third or fourth quarters, though the roads frequently want an earlier position. The Southern railroad has divided 20,000 tons, additional, among the Tennessee Coal, Iron & Railroad Co., the Maryland Steel Co. and the Lackawanna Steel Co. The Southern still is in the market for rails and there are additional lots pending for the Baltimore & Ohio, Chesapeake & Ohio, Seaboard Air line and other roads, aggregating at least 50,000 tons. Total rail orders in February were about 110,000 tons, compared with 200,000 tons in January, 200,000 tons in December and 150,000 tons in November.

Car buying is going on more briskly. Pending inquiries total 10,000 to 15,000. Car orders of the week were as follows:

Pittsburgh Wabash Terminal, 750 gondolas to the Pressed Steel Car Co.

Southern Pacific railroad, 303 tank to American Car & Foundry Co.

New Haven, 500 automobile reported to have gone to Standard Steel Car Co.

Chicago Great Western 200 center construction to Standard Steel Car Co.

Pittsburgh Plate Glass Co., 12 hoppers to Pressed Steel Car Co.

Pittsburgh & Lake Erie, four baggage-mail to Pressed Steel Car Co.

International & Great Northern, 11 passenger types to American Car & Foundry Co.

Total car orders in February were approximately 11,000, compared with 21,700 in January, 10,400 in December, and 11,500 in December.

Heavy buying of locomotives continues, but builders are handicapped by difficulties in obtaining steel. The week's orders include:

New Haven, 50 to American Locomotive Co.

Baltimore & Ohio, 50 to Baldwin Locomotive Works and ten to Lima Locomotive Corporation.

Bessemer & Lake Erie, 20 to Baldwin Locomotive Works.

Russian government, 350 7-ton locomotives to Baldwin Locomotive Works.

The Burlington is inquiring for 50 and the Chicago & North-Western for 70 to 80.

Bridge Contract

Pittsburgh, Feb. 29.—The Ohio-West Virginia Bridge Co., a subsidiary of the La Belle Iron Works, Steubenville, O., has awarded a contract to the American Bridge Co., for a steel bridge to connect the works of the company with the new by-product coke oven plant to be built on the opposite side of the Ohio river. The bridge will involve 5,000 tons of steel. The contract for a battery of 94 by-product ovens was awarded some time ago to the H. Koppers Co., Pittsburgh.

Light Rails are Higher

Chicago, Feb. 29.—An advance of 9 cents per 100 pounds on light steel rails has been made. For some time, light rails have been considerably lower in this market than at Pittsburgh, due to difference of demand. The present increase reduces the difference about half and probably represents the difference in demand between the two markets. The present quotation for 25 to 45-pound rails is 1.61c, Chicago, while Pittsburgh is quoting 1.70c. Buyers can obtain second quarter delivery from Chicago mills, which is much nearer than eastern makers can promise, and some business has been taken in this territory for delivery close to Pittsburgh. Probably present quotations will cut off this demand.

Specifications are being received in large volume for track fastenings and an advance has been made on railroad spikes from 2.50c to 2.60c, Chicago mill, while track bolts have been advanced from 2.75c to 3c, Chicago mill. One interest represented here is quoting nothing lower than 3.25c, Pittsburgh, for track bolts and professes to believe other makers shortly will be at that level.

Small bookings of steel rails are being taken for delivery at convenience and a total of approximately 20,000 tons was booked during the past week in small lots for delivery not earlier than late in the last quarter.

Ties and Rails

Cleveland, Feb. 29.—The Cleveland Railway Co. has purchased 500 tons of 80-pound rails from the Carnegie Steel Co. and a traction company has ordered 1,000 tons. The Cleveland Railway Co. has also contracted for 20,000 steel ties and expects to purchase an additional 10,000.

(*For complete prices see page* 516.)

Basic Sold at High Prices

Philadelphia, March 1. (By wire.)—Standard eastern basic has been sold at about $20.25, delivered, a new high price. A Trenton steelmaker took about 5,000 tons at that figure from eastern Pennsylvania makers.

Will Discuss Corrosion

The New York section of the American Electrochemical Society has accepted the courteous invitation of the American Institute of Electrical Engineers to hold a joint meeting on Friday evening, March 10, at the Engineering Societies' building, 29 West Thirty-ninth street, on the subject of corrosion.

The principal speakers will be Dr. Burton McCollum, bureau of standards, Washington, D. C., for the American Institute of Electrical Engineers, and Prof. William H. Walker, Massachusetts Institute of Technology, Boston, for the American Electrochemical Society.

F. H. Zimmers, for the last 25 years treasurer of the Union Foundry & Machine Co., of Pittsburgh, now is general sales agent of the National Steel Casting Co., which is building a plant at New Cumberland, W. Va. Mr. Zimmers has been secretary of the Pittsburgh Foundrymen's Association for many years and is well known in the foundry and allied trades.

The New York office of the Jeffrey Mfg. Co. will be located after May 1 at 50 Dey street, New York. The present location is 77 Warren street.

Building Awards

More Numerous in East, But Lag in the Central West

New York, Feb. 29.—Recent advances of $5 a ton in the prices of plain material have acted as a spur on prospective building work in this district, and a number of projects of this character have been forced into the market. The new inquiry the past week has been the best in several months. Perhaps 10,000 tons of live work now is in sight. Most of these offerings are of substantial character and include no undertakings of a highly speculative class. It is thought that the higher prices for steel have operated to bring spring work into the market at an earlier date than usual. Normally such propositions come out in March. In some of the pending contracts, buyers are careful to guard details. One of these represents a requirement of 5,000 tons.

CONTRACTS AWARDED.

Illinois Steel Co., structural material for gas blowing engine house, South Chicago, Ill., to American Bridge Co., 225 tons.

Chicago & Alton Railroad Co., one 84-foot 2-inch through-plate girder span over Calumet Sag Channel, near Lambert, Ill., 214 tons.

Sizer Forge Co., Buffalo, N. Y., plant additions, 600 tons, to Ferguson Steel & Iron Co.

Picadilly Theater, Rochester, 300 tons, to Ferguson Steel & Iron Co.

Gleason Works, Rochester, plant addition, 150 tons structural, to Ferguson Steel & Iron Co.

Dr. Roberts, Jamestown, N. Y., business block, 150 tons structural, to Ferguson Steel & Iron Co.

Schoellkopf Analine & Chemical Works, Buffalo, addition, to plant, 100 tons, to Ferguson Steel & Iron Co.

Addition, Goodyear Rubber Co., Akron, 600 tons, Jones & Laughlin Steel Co.

Office building for the American Express Co., 63-65 Broadway, New York City, 4,000 to 5,000 tons, to the Hay Foundry & Iron Works.

Addition to the Mohican Hotel, New London, Conn., 200 tons, to the American Bridge Co.

Building for Oakes Bros., Bloomfield, N. J., 200 tons, to the Hedden Iron Construction Co.

Nocolini garage, Dorchester, Mass., 200 tons, to the Hedden Iron Construction Co.

Gryzmish garage, Allston, Mass., 200 tons, to the Hedden Iron Construction Co.

Pier, East river, New York City, for the Lehigh Valley Railroad, 400 tons, to Levering & Gerrigues.

Bridges for the Central railroad of New Jersey, Allentown, Pa., 200 tons, to the Hay Foundry & Iron Works.

Garage for John Wanamaker on Broadway, New York City, 700 tons, to the American Bridge Co.

Building for Baltimore Sheet & Tin Plate Co., Baltimore, 1,500 tons, to Riter-Conley Mfg. Co.

Mixer building, Youngstown Sheet & Tube Co., 900 tons, to Riter-Conley Mfg. Co.

Bessemer & Lake Erie railroad bridge over Allegheny river, near Pittsburgh, 10,000 tons; to American Bridge Co.

Building for German-American Cement Co. at LaSalle, Ill., 1,025 tons; to the Massillon Bridge & Construction Co.

Three buildings for the Grasseli Chemical Co., 1,548 tons; to W. N. Kratzer Co.

Bridge for the Ohio-West Virginia Bridge Co., a subsidiary of the La Belle Iron Works, 5,000 tons, to the American Bridge Co.

Bridge work for the New York Central lines, 500 tons, to independent shops.

Apartment house, Fiftieth street, New York City, 1,200 tons, to the Passaic Structural Steel Co.

Manufacturing buildings in New England, 600 tons, to the American Bridge Co.

Addition to the store of Bloomingdale Bros., Fifty-ninth street and Lexington avenue, New York City, 1,400 tons, to an independent shop.

Loft building for Karn Bros., Union square, New York, 800 tons, to an independent shop.

Bridge work for the Baltimore & Ohio railroad, largely in Chicago, 1,500 tons, of which 1,150 tons went to the Fort Pitt Bridge Works and 300 tons to the Pennsylvania Steel Co.

CONTRACTS PENDING.

Pier at Forty-sixth street and Hudson river for the City of New York, 4,000 tons, original bids rejected and readvertisement will follow.

Viaduct for the Public Service Co., Kearney, N. J., 500 tons, bids being taken.

Residence for Otto Kahn, Cold Spring Harbor, L. I., 600 tons, bids being taken.

Building for Manning, Maxwell & Moore, Baltimore, 500 tons, bids being taken.

Presbyterian loft building, Newark, N. J., 1,600 to 1,700 tons, bids taken.

Court house, Binghamton, N. Y., 200 tons, bids being taken.

Sub stations for the Interborough Rapid Transit Co., 800 tons, bids being taken.

Hospitals and armories at various locations for the State of New York, several thousand tons, plans about to be issued by State architects.

Building for the Beneficial Savings Fund Society, Fourteenth and Chestnut streets, Philadelphia, 200 to 300 tons, bids being taken.

Heavy Buying

Of Pig Iron of Various Grades Continues at Pittsburgh

Pittsburgh, March 1. (By wire.)—Heavy buying of steelmaking and foundry pig iron grades continues in the greater Pittsburgh district. The Westinghouse Air Brake Co., Wilmerding, Pa., has purchased about 20,000 tons of low silicon foundry and malleable iron for second, third and fourth quarter delivery. Fallansbee Bros., Follansbee, W. Va., today is closing for about 9,000 tons or 10,000 tons of basic for second half delivery. Union Steel Casting Co. yesterday bought 1,500 tons of bessemer iron and the McConway-Torley Co. took about 2,000 tons of bessemer and 2,000 tons of malleable for second half delivery. A valley interest closed for 1,200 tons of bessemer iron at $21, furnace. A local manufacturer of sanitary ware has taken 5,000 tons of foundry at $18.50, valley.

New Converter.—The Jones & Laughlin Steel Co. is installing a 20-ton converter at its plant at Woodlawn, Pa. The company will operate seven converters when the work at the plant is completed.

(*For complete prices see page* 516.)

Third Stack

Is Being Contracted for by the Inland Steel Co.

Chicago, Feb. 29.—The Inland Steel Co. has begun to let contracts for the construction of a third blast furnace stack at its Indiana Harbor works. The blast furnace plant now consists of two stacks and when the third is in operation the daily output of pig iron will be 1,500 to 1,800 tons. The third stack was made necessary by the additional eight open hearth furnaces now being built.

Bessemer and Basic Averages

Pittsburgh, March 1. (By wire.)—The average price of bessemer and basic iron for February, according to compilation made by W. P. Snyder & Co., was $20.2136 and $17.984 respectively at valley furnace. Averages are based on sales of 1,000 tons or more. Comparative figures for the preceding month show that bessemer declined $0.4314 and basic advanced $0.151. This is the first decline registered by bessemer iron for nine months. It is caused by the heavy purchase of the Youngstown Sheet & Tube Co., which bought about 20,000 tons at $20, valley. Comparative figures for the corresponding month a year ago shows that bessemer iron last month advanced $6.6136 and basic iron advanced $5.484.

Sheets Advance

Pittsburgh, March 1. (By wire.)—Makers of steel sheets in western Pennsylvania are advancing prices sharply. The American Sheet & Tin Plate Co. now is quoting No. 28 gage bessemer black sheets at 2.75c and is asking $2 a ton above that figure for open hearth steel material. No. 10 blue annealed sheets are being held at 2.90c for bessemer and 3c for open hearth material.

Death of Franklin Alter

Franklin Alter, president of the American Tool Works Co., Cincinnati, died at his residence, 3669 Reading Road, that city, Feb. 28, after a long illness of a complication of diseases. Mr. Alter was born in Carlisle, Pa., in 1831, but spent most of his boyhood at Hagerstown, Md., and went to Cincinnati in 1850.

THE OPEN HEARTH

A Public Nuisance

THE self-appointed committee on industrial relations, successor to the late commission on industrial relations, has the nerve to send out a general appeal for financial support to enable it to keep up its pernicious activities. The appeal, which has been sent broadcast, states that the trade unions "have assured us financial aid" and ask that others join with the unions in this financial support. It is also stated that the committee is now conducting a vigorous compaign to secure the printing by congress for free distribution of 200 copies of the numerous reports of the commission and 10,000 copies of the testimony taken by that body. We believe that the printing of any more copies of the reports, which differ radically as to the cures for industrial ills, or the printing of the vast volume of testimony would be an utterly unjustifiable expenditure of public money and that for anyone to contribute toward paying the expenses of the committee would be helping in maintaining a public nuisance.

In recent issues of *The Iron Trade Review,* we have referred to some of the untruthful and extremely unjust statements made by the committee on industrial relations concerning the Youngstown Sheet & Tube Co., in connection with the strike of last January. Although official investigations are not yet concluded and more facts will be developed, several points which we have not referred to are worthy of attention now. For example, the committee's investigator asserted, "The workers and their families live in squalid houses and a trachoma epidemic at East Youngstown grew so menacing that the Youngstown Sheet & Tube Co., whose armed guards on Jan. 7 killed three strikers and wounded 25, had to take drastic measures to save the human part of its equipment." It is true that living conditions in East Youngstown are not as good as they ought to be, but this is in spite of the efforts of the company. Although the company pays about 86 per cent of the taxes in East Youngstown, and throws its influence on the side of temperance and other good causes, and tries in every legitimate way to promote legislation to improve sanitary conditions, it cannot interest itself aggressively in elections, for if it did so, it would be accused of bossism and intimidation. The company's chief surgeon, Dr. McCurdy, was elected head of the board of health and did inaugurate some very desirable reforms, but was removed some time since. As to the trachoma epidemic, the company went to much expense caring for all cases it could find and maintained for about two years a trachoma hospital, with a staff of efficient specialists and nurses, and gave treatment absolutely free of cost to the patients, whether they were employes of the company or not. Investigation has not shown that the armed guards killed three strikers and wounded 25. One of the men killed was a brakeman. While the investigation has not yet been finished, it seems probable that he was killed by the rioters, rather than by a company guard. The second man killed was shot by the proprietor of a store which he was attempting to loot. The evidence as to the third man killed is not clear as to the cause of his death.

The facts already ascertained by investigation, official and otherwise, clearly show the utter unreliability of the investigators of the committee on industrial relations and we trust that no manufacturer will for one moment be deceived by the letters which are now being sent out from the Washington office of the committee. The more quickly this committee ceases its activities, the better it will be.

A Question of Gages

MANY patriotic American citizens have found a certain amount of comfort in the thought that the capacity developed in this country during the past year or more for the manufacture of war munitions would prove exceedingly useful in case the future brings us a war of our own. Any reflection, however casual, over the experience of the munition makers, leads to the conclusion that such a belief should take into account all factors in the situation. Next to volume of output, the chief factor involved in manufacturing modern implements of war is precision of workmanship, since arms and ammunition must be machined to microscopic limits of accuracy, and thousands of gages must be provided with which to test the accuracy of his work. The importance of having a plentiful supply of gages is indicated by the statement that approximately 1,250 machine operations, for each of which one or more separate gages are needed, are performed in making the standard United States army rifle. The number of sets of such gages which would be required in case this country should be forced into a war, certainly would run into many thousands. Equally large would be the requirements in gages for use in producing all other kinds of war munitions made with machinery.

The gages generally are small, but their manufacture is a laborious and time-consuming process. The mechanics capable of making them are comparatively rare, since the maximum allowable error in the majority of cases is 0.0001 to 0.00005 inch. In working to such fine limits the micrometer proves quite useless and extremely sensitive measuring machines must be employed. As an example of the

THE OPEN HEARTH

labor involved, it is stated that the 140 separate gages required for making the new British time and combination fuse, No. 80, Mark 7, cost approximately $3,000 a set. Hundreds of sets of gages for this particular piece of work now are being made. One single gage for the well-known Remington rifle costs $80. The difficulties attendant upon the manufacture of gages in large quantities, and the great amount of time consumed is a matter for the serious consideration of our government, since it is commonly understood that the gages now on hand would permit the manufacture of war munitions in limited quantities only. The gages used in manufacturing munitions for foreign governments naturally are useless for our own purposes, since foreign specifications differ from those adopted by this country.

Two Great Decisions Compared

THE decision by Judge Rose, in the United States district court at Baltimore, in the dissolution suit of the government against the American Can Co., slightly resembles the decision in the Steel Corporation case in one particular, but in most important findings, is radically different.

It will be recalled that in the decision of the court in the Steel Corporation case, the majority opinion declared that with the competition left outside by the Steel Corporation, a monopoly of the steel and iron business of the United States was simply impossible and that no effort was made to secure these outside companies; that in view of the fact that the proportionate volume of competitive business has increased since the Steel Corporation was formed and the proofs show no attempt by it to establish a monopoly, to now attribute to those who formed the Corporation an intended monopoly, would be to say that, having formed the Corporation for the purpose of monopoly, they immediately abandoned such purpose. Even the dissenting views of Judges Woolley and Hunt asserted that by the vast amount of testimony it was conclusively shown that the Steel Corporation did not attempt to exert power, if such it possessed, to oppress and destroy its competitors, and the judges added that it was likewise disclosed by the history of the industry subsequent to the organization of the Corporation that if it had made such an attempt, it would have failed. In the case of the American Can Co., however, the court found that the company was organized to monopolize interstate trade in cans, and to attain that object, such trade was unlawfully restrained by it and by those who formed it and directed its early activities. In other words, while as to the main charges in each case, the Corporation was acquitted, the Can company was condemned.

Now as to the point of resemblance in the two opinions. In the case of the Steel Corporation, the court held concerning the so-called Gary movement that the testimony made the conclusion inevitable that the result was an understanding about prices which was equivalent to an agreement. "But," said the court, "the period of co-operation had passed away before the bill was filed, and as far as we can see, it is not likely to be repeated. We do not think the Gary movement would justify us in imposing so drastic a penalty as the dissolution of the Corporation, but we will, if the government moves for such action, retain the bill for the purpose of restraining any similar movements by the defendants that might be contemplated hereafter. We may perhaps suggest that under recent legislation congress may have provided a sufficiently inclusive remedy for any future action that might have as its object the adoption of the maintenance of unreasonable prices." Apparently the only thing feared by the court was the possibility of reviving the Gary movement and it was inclined to the opinion that the success of such an attempt might be prevented by recent legislation, doubtless having in mind the law creating the federal trade commission. In the decision in the Can company case, the court calls attention to the fact that what the government fears is that the defendant will, to the public prejudice, hereafter dangerously use the strength which it gained by its original law-breaking. Then the court, in proposing to retain the bill, says that, without at present decreeing a dissolution, it will reserve the right to do so whenever, if ever, it shall be made to appear to the court that the size and power of the defendant, brought about as they originally were, are being used to the injury of the public, or whenever such size and power, without being intentionally so used, have given to the defendant a dominance and control over the industry, or some portion of it, so great as to make dissolution or other restraining decree of the court expedient. Apprehension as to what may happen seems to be more serious in the case of the Can company than in that of the Corporation.

Both of these highly important decisions clearly recognize the folly of annihilating a great company because in its inception and perhaps in the earlier years of its existence, its managers were guilty of illegal acts. The decisions are in harmony with the more reasonable attitude of the country toward business which will give it ample opportunity to go forward uninterrupted by any activity of the government not demanded by the public interest.

Prices Present and Past

Quotations on leading products March 1, average for February, 1916, average for December, 1915, and average for March, 1915. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Mar. 1, 1916.	Aver. for Feb., 1916.	Average for Dec., 1915.	Aver. for Mar., 1915.
Bessemer pig iron, Pittsburgh	$21.45	$21.45	$19.85	$14.55
Basic pig iron, Pittsburgh	18.95	18.77	18.55	13.45
No. 2 Fdy. pig iron, Pittsburgh	**19.45**	19.51	18.85	13.80
Northern No. 2 Fdy., Chgo.	**18.50**	18.50	18.10	13.00
Lake Superior Charcoal, Chgo.	**19.75**	19.50	19.15	15.75
Mall., Bess., Chgo.	**19.00**	19.00	18.10	13.00
Southern No. 2, Birmingham	15.50	15.25	14.13	9.38
Southern Ohio No. 2, Ironton	**18.00**	18.00	17.00	12.75
Basic, eastern Pa.	**19.50**	19.50	18.00	14.00
No. 2X Virginia furnace	**18.00**	18.00	17.00	12.50
No. 2X foundry, Philadelphia	**20.00**	20.00	19.25	14.25
Ferro mang., Balti., (forward)	150.00	140.00	100.00	100.00
Bessemer billets, Pbgh.	40.00	34.00	29.60	19.50
Bess. sheet bars, Pbgh.	40.00	34.00	30.80	20.00
Op.-h'th sh. bars, Pbgh.	40.00	35.00	30.80	20.00
Open-hearth billets, Pbgh.	40.00	35.00	30.20	19.50
Steel bars, Chgo.	2.54	2.23	1.97	1.34
Steel bars, Pittsburgh, contr.	2.25	2.01	1.74	1.15
Iron bars, Philadelphia	2.559	2.409	1.959	1.15
Iron bars, Cleveland, local del'y.	2.40	2.29	1.75	1.15

	Prices Mar. 1, 1916.	Aver. for Feb., 1916.	Average for Dec., 1915.	Aver. for Mar., 1915.
Iron bars, Chgo. mill	$2.10	$1.91	$1.70	$1.10
Beams, Chgo.	2.54	2.22	1.97	1.34
Beams, Pittsburgh, contr.	2.25	2.03	1.74	1.15
Beams, Philadelphia	2.409	2.259	1.959	1.25
Tank plates, Pbgh., contract	2.25	2.13	1.74	1.125
Tank plates, Chicago	2.64	2.33	1.97	1.34
Tank plates, Philadelphia	2.959	2.709	1.959	1.25
Sheets, blk., No. 28, Pbgh.	**2.60**	2.60	2.54	**1.80**
Sheets, blue an., No. 10, Pbgh.	2.60	2.61	2.23	1.30
Sh., galv., No. 28, Pbgh.	5.00	4.75	4.25	3.40
Wire nails, Pittsburgh	2.40	2.22	2.02	1.60
Connellsville fur. coke, contr.	**2.50**	2.50	2.35	1.65
Connellsville fdy. coke, contr.	**3.50**	3.75	3.00	2.25
Heavy melting steel, Pbgh.	17.00	17.37	17.40	12.00
Heavy melting steel, east'n Pa.	**16.50**	16.50	16.00	11.00
Heavy melting steel, Chgo.	15.00	15.25	15.40	9.75
No. 1 wrought eastern Pa.	22.50	22.50	20.00	12.50
No. 1 wrought, Chgo.	15.00	14.93	15.15	9.00
Rerolling rails, Chgo.	16.75	17.12	16.70	10.00
Car wheels, Chgo.	13.75	14.06	14.75	10.00

(For Additional Prices See Page 516.)

Active Buying of Pig Iron Continues

Jones & Laughlin Steel Co. Take Large Tonnage—New England Embargoes Interfere Seriously With Deliveries and Restrict Buying

Cleveland, Feb. 29.—The pig iron market is active and exceedingly strong. Inquiries for about 60,000 tons are pending. One Cleveland agency has sold fully 130,000 tons this month and some lake furnaces have sold 80 per cent of the production which they expect to have during the last half of the year. The Kokomo Steel & Wire Co. has covered for its requirements for basic which will be between 25,000 and 30,000 tons to be shipped from Detroit. Part of the large tonnage of basic which has just been purchased by the Jones & Laughlin Steel Co., understood to be from 40,000 to 60,000 tons, will come from furnaces represented by Cleveland agencies. Quotations at Toledo on No. 2 foundry have been advanced to $19.25, furnace for delivery outside of the city and $19.50 for delivery within the city, while at Detroit, the price of No. 2 foundry has been advanced to $19.80. The recent reduction in the Cleveland price to $19, delivered in the city, instead of $19.30, which had been obtained for some time, was due to southern competition and not, as reported, to sales made by a valley company. With southern iron selling at $19, delivered Cleveland, Cleveland furnaces considered it necessary to sell at the same price. Now, however, $19.50, Cleveland, for first half and $20 for last half are minimum quotations on No. 2 southern foundry. Prices of Jackson county silveries, 8 per cent, have advanced $2 per ton, making the price $27, Jackson, or $28.62, Cleveland. Quotations on bessemer ferro-silicon have been advanced from $2 to $3 per ton.

Active Buying Continues

Pittsburgh, Feb. 29.—Active buying of pig iron continues to feature the market in western Pennsylvania and eastern Ohio. The Jones & Laughlin Steel Co. has just closed negotiations for a heavy tonnage of standard basic iron for third quarter delivery. While no official information has been given out, it is understood that the iron involved commanded not less than $18, valley furnace, and that figure now appears to represent the market. A local dealer, who is understood to have furnished part of the Jones & Laughlin tonnage, late last week bought 15,000 tons of basic at $18, valley, and another sale of 5,000 tons of basic at the same figure is reported. Two thousand tons of bessemer iron for export have been sold at $20.50, valley, and two local consumers have closed for a total of 1,500 tons at the same figure for shipment the remainder of the year. The Standard Sanitary Mfg. Co. has closed for approximately 5,000 tons of southern foundry iron for its plant at Louisville, Ky., at $15, Birmingham, and slightly less for No. 2 foundry. Malleable, gray forge and steel foundries in this district have taken from 5,000 to 10,000 tons of miscellaneous foundry grades at prevailing prices. The Standard Steel Works, Burnham, Pa., has opened negotiations for 1,500 tons of second half basic; Follansbee Bros., Follansbee, W. Va., have entered for 9,000 tons of basic for second half delivery; McConway & Torley Co. are asking bids on 1,700 tons of bessemer and 1,700 tons of malleable iron, and the Union Steel Casting Co. wants 1,500 tons of bessemer iron for delivery after July 1. Heavy stocks of pig iron carried on Jan. 1 are being liquidated rapidly and it is likely that prices will stiffen at an early date. According to estimates, approximately 1,000,000 tons of pig iron were carried in stock at the opening of the year.

Buying More Active

Chicago, Feb. 29. — Melters of both malleable and foundry pig iron are in the market actively for last half re-

(*For complete prices see page* 516.)

quirements and considerable tonnages are being booked by all makers. Malleable iron seems to be in stronger demand at present than foundry, although melters of the latter are anxious to cover their requirements.

Buying has not yet reached the point where prices are likely to be advanced and there is a disposition on the part of some makers to let well enough alone for the present, although an increase will be made when a sufficient proportion of last half production has been booked.

Competition of charcoal iron and southern foundry iron also has a tendency to hold prices at present levels until conditions change. Inquiry now current is better than 25,000 tons and much of this is being satisfied each day on sales running as high as 3,000 tons. At the same time that last half iron is active, steady buying of small tonnages for second quarter is being done, as melters find they need more iron than they had estimated.

Southern iron exhibits considerably more firmness and first half is now quoted at $15, Birmingham, while $15.50 to $16, Birmingham, is being asked for last half. The lower quotation seems to be disappearing and sales are being made at the higher price.

Jackson county silveries have been advanced recently $2 per ton, from $25 to $27, furnace, for 8 per cent. This makes the price delivered at Chicago $27.54. Two important producers have made this advance and another is about to do so.

Bessemer ferro-silicon has been advanced $3 per ton to $31, for 10 per cent. No change has taken place in the situation as to Lake Superior charcoal iron. Basic buyers are not interested and no inquiry for this grade is now current.

New England Hard Hit

New York, Feb. 29.—Freight difficulties again have become the predominant influence in the pig iron market, especially as to New England delivery, through the restoration of the embargo by the New Haven railroad on iron and steel, coal and coke and practically all manufacturing commodities. The New Haven system has found its facilities utterly inadequate to move the rush of freight that lately has been delivered to its lines. At present it has over 55,000 cars on its lines and it has found it necessary to shut off new freight until the present accumulation is worked away. With the embargo condition on other roads, practically all of New England now is under the ban. Opinion in the iron trade is that the facilities of the New England roads are not capable of handling the present enormous volume of business in that territory and that recurrences of the placing and lifting of embargoes may be expected to continue indefinitely. The position of New England consumers of pig iron continues one of embarrassment, since, since at no time recently have they been able to receive normal delivery, and their stocks have been lowered considerably. New buying of iron in part is being restricted by the present embargoes and is light. The Eastern Malleable Iron Co., or Malleable Syndicate, has purchased several thousand tons of malleable for last half and still is figuring on further tonnage. A South Norwalk, Conn., buyer took 600 tons of foundry. A Newark, N. J., furnace manufacturer has purchased 1,000 tons of No. 2X for last half; the New Jersey Zinc Co. for 500 tons and another Jersey buyer for 500 tons, all foundry. The General Electric Co. is reported in the market for several thousand tons of special grades. Prices have indicated some softness in different districts. At New Jersey tidewater, $19.75, delivered, for last half, No. 2X, was quoted on eastern Pennsylvania iron. New England consumers report having bought iron from the Buffalo district at around $18, furnace, for No. 2X, or about $20.50, delivered. One Buffalo interest is holding 2X at $19 for first half and at $19.50 for last half.

No General Buying Yet

Philadelphia, Feb. 28.—A broader and somewhat more diversified market in pig iron prevails in eastern Pennsylvania, but there are no signs of a genuine buying movement. The underlying tone is better. Prices among eastern Pennsylvania makers show a narrower range, but the situation is not without some irregularity from time to time. Orders for eastern Pennsylvania No. 1X were taken in the week under close competitive conditions at $19.75, furnace. Most furnaces hold No. 2X at $19.50 to $20, furnace, or $20 to $20.75, Philadelphia. A Reading consumer took 1,000 tons of No. 1X for last half. Delaware river pipemakers purchased several thousand tons of off-cast quality at $18.50, delivered. A number of inquiries for foundry of 500 to 1,000 tons each are out. Virginia iron is quiet and unchanged. The Lukens Iron & Steel Co. finally has exercised options for 7,500 tons additional of basic for last half, which were entered into recently when purchases of 77,500 tons were put through by this buyer. The latest purchase brings the total bought to 85,000 tons, all at $19.50, delivered. The amount of buying of basic done by a Trenton, N. J., consumer is not yet clear. The recent closing in this territory of a block of low-phosphorus Buffalo basic, is understood to have been done at about $20.50, delivered, or $18, furnace. Makers in this district hold basic at $19.50 to $20, delivered, eastern Pennsylvania. A sale of 1,000 tons of high sulphur, low phosphorus iron at $32, furnace, by a Lebanon maker, seems to discount much of the recent reports of lower prices in that territory. More tonnage for last half has been offered by consumers to Lebanon makers who probably will be obliged to announce prices soon. There is talk that considerably over $30, furnace, may be asked. A moderate buying of standard low phosphorus for last half continues at unchanged prices.

(*For complete prices see page* 516.)

Steelmaking Grades Firm

Youngstown, Feb. 29.—No large sales of pig iron have been made since the purchase of 25,000 tons of bessemer iron by the Youngstown Sheet & Tube Co., reported last week. The market for steelmaking grades is firm, with bessemer quoted at $20 to $20.50 and basic held at $17.75 to $18. An offer of $20 for round tonnage of bessemer iron, delivery extending over six months, was refused by one producer. The heavy tonnage purchased by the Youngstown Sheet & Tube Co. was taken at that figure, and it is believed the minimum will be established shortly at $20.50.

Price Advance Predicted

Buffalo, Feb. 29.—In the face of a market that is superficially weak but fundamentally strong, producing interests generally are inclined to the belief that the increasing activity of the melters as the season advances is more than likely to bring about a sharp advance in the prices of the various grades of pig iron, such as recently noted in the products of the steel mills.

The sales for the week were from 15,000 to 18,000 tons of the various grades, with a considerable tonnage being steelmaking iron for delivery into the last half of the year. The selling was confined largely to one interest that shaded its prices slightly from the schedules quoted a week ago.

Other producers here are not seeking further sales, however, as their order books are well filled. One interest reports that it is sold up solid on practically all lines of grades through first half and all of third quarter and in some grades its furnaces will be taxed into the early part of fourth quarter in order to

effect deliveries, if all of its iron under contract is ordered out.

The shading on the part of one interest had but a temporary effect upon the schedules which now seem to be re-established at the figures quoted a week ago for deliveries over the first half of the year, making a range of $18.50 as a minimum on low grades to $19.50 as a maximum on the higher silicon irons. Such tonnages of No. 2X foundry as are available over first half are quoted at $18.75 to $19, while $19 to $19.25 is being asked for the same grade for last half deliveries. On the average an advance of 50 cents per ton is being asked for last half needs.

Interesting Developments

Birmingham, Ala., Feb. 29.—Some interesting developments characterized the Birmingham pig iron market at the very "shank" of the week. On Saturday afternoon one interest sold 7,000 tons of standard Alabama iron at $15.50 for last half delivery. This same concern sold a total of 2,600 tons during the week of special analysis iron at $17.50 per ton, last half delivery for silicon 2.50 per cent, and $18 for silicon 3 per cent and over. This marks a premium of $2 per ton over standard iron. Another interest sold 1,100 tons for last half delivery at $16 per ton at the furnace, and some small lots for first half delivery at $15 per ton at the furnace. The aggregate tonnage for other interests range from 6,000 to 8,000 tons on basis of $15 per ton for first half delivery and $15.50 per ton for last half delivery. There is no doubting the fact that the price has crystalized at $15 for first half and $15.50 for last half delivery. There is much heard on every hand as to the probable trend of the market. Taking as a criterion the heavy demand for basic iron—which will bring $15.50 per ton all through the year—it is not reasonable to suppose that the foundry market will fall below present prices, from the fact that the furnaces of the district are in position to turn their stacks over on basic iron within a short time, and have their pig casting machines. Any tendency to lower prices in founrdy iron would only tend to induce the furnaces to turn to basic, thereby relieving the foundry trade. One of the large producers of the district has already pursued this policy through the last half. While there has not been any "flurry" in buying, yet buyers have quietly stepped in the past two weeks and taken away good, substantial tonnages of Birmingham iron. The pipe interests have not yet come in strong; and with the waning of the first quarter, it is believed that the next 30 days will witness considerable interest on the part of some of the large buyers. The North Alabama furnaces, as well as the Chattanooga furnace, have had considerable bearing on the market by reason of their differential, both in water and rail transportation—but the strictly Birmingham district furnaces have been maintaining well the present standard prices.

Looking Upward

St. Louis, Feb. 29. — The pig iron business continues to show signs of improvement in this district. Inquiry in the market today includes 1,000 tons of Lake Superior charcoal iron and 500 tons of northern coke iron, both for last half delivery, with quite a tonnage of inquiries for 100 to 200 ton lots of northern and southern iron. Sales last week included 3,000 tons of malleable, 300 tons of bessemer ferro-silicon, and quite a number of 100 and 200-ton lots.

Southern iron is strong at $15, Birmingham, for delivery up to July 1, and at $16, Birmingham, for delivery over the last half of the year. The freight from Birmingham is $3.40 a ton. Northern iron is stiff at $18.50 to $19, Chicago, and $18 to $18.50, Ironton, for all deliveries.

Large Basic Sales

Cincinnati, Feb. 29.—The Andrews Steel Co., Newport, Ky., is in the market for from 12,000 to 15,000 tons of basic iron, and the Scullin Steel Co., St. Louis, is out for a new lot of 15,000 tons of the same grade after purchasing a like tonnage a short time ago. Basic iron has been selling in large quantities in this territory during the past three weeks, the aggregate tonnage placed amounting to between 110,000 and 115,000 tons, divided as follows, all previously mentioned in *The Iron Trade Review*: The Kokomo Steel & Wire Co., Kokomo, Ind., 25,000 to 30,000 tons; the American Rolling Mill Co., Middletown, O., 20,000 to 25,000 tons; the Scullin Steel Co., St. Louis, 15,000 tons, and the Whittaker-Glessner Co., Portsmouth, O., 45,000 tons. Recent sales of foundry iron include 2,000 tons of northern and southern grades to a Ft. Wayne, Ind., melter, and from 2,000 to 3,000 tons of the same to a Connellsville, Ind., user. Sales ranging from 200 to 400 tons each have been numerous during the past week, and a large number of inquiries of like amounts are pending, and are being closed each day. Northern foundry iron is in much better demand than southern makes. Southern Ohio No. 2 foundry and basic are quoted at $18, Ironton basis, for 1916 shipment, with a tendency to advance in the near future. Southern No. 2 foundry is quoted at from $15 to $15.50, Birmingham basis, for the first half, and from $15.50 to $16 for the second half. Silvery iron has been advanced for the second half to $25.50, furnace, for 8 per cent silicon, and the first half price is firm at from $25 to $25.25.

(*For complete prices see page* 516.)

Wire Advanced

Prices are Again Marked Up—Demand Very Strong

Pittsburgh, Feb. 29.—The American Steel & Wire Co., effective March 1, advanced wire products $2 a ton to $2.40 a keg for nails and $2.25 per 100 pounds for plain wire and $3.25 per 100 pounds for galvanized wire. This advance follows one of $2 a ton, announced Feb. 11. Wire products have been put up $6 a ton this year and now are commanding the highest prices to prevail since April 21, 1900, just prior to which date wire nails were quoted at $3.20 a keg. It will be recalled, however, that the market arbitrarily was established at that time, having declined to $2.20 a keg, April 21, 1900, at which figure nails were sold until Jan. 29, 1901, when they were put up $2 a ton. Fencing wire has been advanced two points to 61½ per cent, and it is likely that cement coated nails and cut nails will be advanced before the end of the week.

Very Strong

Cleveland, Feb. 29.—The wire market is very strong, specifications are heavy and mills are requiring absolute adherence to contract requirements. The price of concrete reinforcing fabric has been advanced $2 per ton. Sulphate of iron, a by-product of the wire manufacturing business, has been advanced $9 and is now quoted at $20.

New Mill Starts

The new blooming mill of Corrigan, McKinney & Co., Cleveland, was turned over for the first time Monday and is running satisfactorily.

The Lucy Mfg. Corporation, New York City, has completed negotiations for the purchase of the Union Iron Works, Houston, Texas. The plant will be equipped for the manufacture of oil well supplies. The company now has five plants in this country.

The Kempsmith Mfg. Co., maker of milling machines, Milwaukee, has increased its capital from $200,000 to $250,000, and will make additions to its plant. Details are not yet completed.

Very High Plate Prices

Premiums Freely Paid for Prompt Delivery, Car Load Sold at 5c Mill in the East—More Ship Steel

Philadelphia, Feb. 28. — More plate tonnage continues to be offered the mills than their present order books and capacities will permit them to accept with the result that prices on this product are unusually strong. Comparatively early deliveries command attractive figures for the seller. A western Pennsylvania maker disposed of 600 tons to a buyer in the Chicago district for delivery in eight to ten weeks at 3.50c, mill. A carload for immediate delivery brought the extraordinary price of 5.00c, mill. Eastern mills in the week took tonnage from regular customers at 3.25c, Pittsburgh, the earliest possible delivery on which is six months. The minimum price which eastern mills are quoting seems to be 3.00c, Pittsburgh. Much tonnage is being turned away because the deliveries cannot be satisfied. A new ship building plant to be established along the Delaware river for operations to be inaugurated in August has asked for 600 tons monthly for an indefinite period. The American Car & Foundry Co. has out some inquiries for car plates. The Carnegie Steel Co. will supply the 12,000 to 15,000 tons of steel for four new boats announced last week as going to the Cramp and New York Ship Building Co.'s yards.

Plates at 2.35c

Pittsburgh, Feb. 29.—Despite prevailing high prices, consumers of plates are buying for forward shipment, although most of them are estimating requirements more closely than previously. Leading manufacturers of plates, shapes and bars in western Pennsylvania have sold their output for the remainder of the year and it is frequently predicted that further advances in price will be made before July 1. Car and ship builders are specifying briskly and are paying prevailing prices for additional material.

High Plate Prices

Cleveland, Feb. 29.—The 600-foot steel steamship which has just been ordered by the Pittsburgh Steamship Co., from the Great Lakes Engineering Works, Detroit, will require about 5,000 tons of steel, which will be furnished by the Carnegie Steel Co. The plate market is strong and local mills are getting 3c per pound for a considerable part of their tonnage. They are quoting 2.90c to 3.20c on No. 10 blue annealed sheets.

Plate Premiums High

Chicago, Feb. 29.—Shortage of steel plates continues the feature of the finished steel market. Demand for this material for car and ship building as well as other uses has resulted in a famine and only a few makers are able to supply any at reasonably prompt delivery. A recent sale was made by a middle western mill of several hundred tons at 3.40c, Pittsburgh, for ¼-inch plates. This is a premium of $21 per ton over nominal mill quotations. Other makers are quoting from 3c to 3.40c, Pittsburgh, and are booking material without difficulty.

Quotations by leading makers for delivery at convenience, practically 10 to 12 months in the future, are 2.54c, Chicago mill.

Sheet Mills

Are Embarrassed by Car Shortage — Gondolas Being Used

Youngstown, Feb. 29.—A serious shortage of cars threatens to restrict the activities of the sheet mills in this district. Shipments for some weeks have been delayed by the inability of the railroads to furnish sufficient rolling stock, but in the past few days this stringency has become serious. One mill requested 20 cars both yesterday and today and received only one car each day. In some cases, finished sheets are being forwarded in gondolas. Railroad managers hold out little hope for any immediate betterment of conditions. On export shipments, some mills are protecting themselves against loss through inability to ship their finished product. A clause is being inserted calling for payment on presentation of satisfactory evidence that the goods are ready to be forwarded. The buyer also assumed a moderate charge for storage in the producer's warehouse. The market continues to be featured by a strong demand for the heavier gages. Blue annealed No. 10 is held at 2.60c to 2.80c, Pittsburgh. One producer has raised quotations on this grade to a 2.90c base. The same interest is now quoting on automobile body stock on a 3c base. The market for galvanized continues quiet. The minimum of 4.75c on galvanized No. 28, has disappeared. It has been practically nominal for several weeks. The leading interest is understood to be quoting 5c on third quarter business, while the independents are asking 5.25c. Mills running on light gage stock are operating at about 50 per cent of capacity, due to reasons previously emphasized and in particular to the virtual shutting off of the roofing trade due to high spelter prices. Black sheets No. 28 are quoted at 2.60c to 2.75c, with the bulk of the business moving at the range between 2.65c and 2.75c.

Sheet Demand Heavy

Pittsburgh, Feb. 29.—Manufacturers of steel sheets are being besieged for material for delivery the second half of the year, but most concerns have not booked any tonnage for shipment after July 1. Automobile manufacturers are endeavoring to cover needs for the year beginning July 1, and it is evident that some of them will not be able to obtain desired tonnages. Electrical equipment makers also are scrambling for material and appear willing to pay premium prices, when definite shipments can be promised. The tendency of prices is upward, although some irregularity still is reported for black sheets. This is because of the fact that heavy black sheets are being offered as a substitute for galvanized products in a great many instances. Galvanized material is selling at 4.75c and above for No. 28 gage. As high as 2.80c and even 2.90c has been paid for No. 10 blue annealed sheets.

Sheets are Irregular

Chicago, Feb. 29.—Quotations on steel sheets are difficult to make with certainty. The range is unusually wide and prices depend considerably on the gage desired as well as whether the sheets are rolled from bessemer or open hearth sheet bars. The bessemer sheets are somewhat cheaper than open hearth.

Blue annealed sheets are being quoted in this market at 2.84c to 3.19c, Chicago. Delivery is slow and on this account demand is not as heavy as a short time ago, as consumers realize they cannot get material promptly. No. 28 gage black sheets are being quoted at 2.89c to 3.09c, Chicago, and black automobile sheets at 3.19c, Chicago.

Sell Higher for Future

Philadelphia, Feb. 28.—Several contracts for sheets for delivery in the third quarter have been placed with eastern Pennsylvania makers at 3.25c, Pittsburgh, for No. 10 gage blue annealed, an advanced price. The makers, however, are not inclined to sell freely for such distant shipments. Buyers still put forth inquiries for these forward positions and exert ef-

(*For complete prices see page* 516.)

forts to get the mills to sell. Prices of eastern makers covering early or deferred shipment range from 3.00c to 3.25c, Pittsburgh, or 3.159c to 3.409c, Philadelphia, for 10 gage blue annealed.

Bar Contracts Limited

Agricultural Implement Manufacturers Covered for Six Months Only by Chicago Sellers

Chicago, Feb. 29.—One of the features of the steel bar market is the fact that makers of agricultural implements have been forced to accept contracts for six months from July 1 instead of being able to cover for their requirements for a full year from that date, as they usually have been able to do. When steel tonnages remaining unsold for 1916 were apportioned in January, as then reported in these columns, these consumers were given the same proportion of their requirements as other buyers and at the same price, 1.90c, Pittsburgh, for delivery to Jan. 1, 1917.

The apportionment was not sufficient to meet needs and at once requests were made of other steel companies to book a further tonnage, but this is believed to have met with little success.

The tonnage involved in this distribution to agricultural implement makers is about 100,000 tons, which is considerably under the usual requirements in the west. The price, 1.90c, Pittsburgh, is a heavy advance over bars bought a year ago for last half and first half, when 1.20c to 1.25c, Pittsburgh, was paid. Bars being delivered over the present half are, at this price, fully $20 per ton lower than present quotations on steel bars.

A feature in the steel bar market is an expected inquiry from the French government for heavy steel bars. Rumors that this will be put out shortly have been heard and the probability of its being booked in the west is slight unless it is taken on a contract contingent on new productive capacity being put into operation during fourth quarter. Other mills will be unable to handle it with the plants they now have. Heavy inquiry is being received from eastern consumers unable to buy in their own territory, but inasmuch as western mills are unable to care for tonnage desired by regular customers, this is not being taken. Quotations on soft steel bars are nominal at 2.44c, Chicago mill, for delivery at convenience of mill, which practically means early in 1917.

Hard steel bars have been advanced to 2.25c, Chicago mill, for first half delivery. Two makers are quoting this price, while another, which has not been in the market recently, its books being well filled, has not yet announced any price. Sales had been made at 2.10c, Chicago mill, before this quotation was announced.

The Agricultural Situation

Cleveland, Feb. 29.—The steel bar situation, as far as the agricultural implement manufacturers are concerned, has not yet developed fully in this territory. Although contracting has been done rather freely in the Chicago district at 1.90c, Pittsburgh, by these manufacturers, there has been little if any contracting in this section and most of the mills are adhering to 2.25c as the minimum for any buyer. It seems probable, however, that, as usual, the agricultural implement concerns will be granted concessions and that contracts will be made with them by some mills at 1.90c for the 6-month period beginning July 1, but some sellers say very positively that they will not contract at less than 2.25c.

Steel Bars Scarce

Pittsburgh, Feb. 29.—Heavy buying of steel bars for domestic purposes has featured the market the last fortnight. As briefly indicated by *The Iron Trade Review* a week ago, agricultural implement makers have closed for heavy tonnages for shipment before Jan. 1, 1917, having been unable to buy for delivery after that date. They were forced to pay prevailing prices at the time their purchases were made, which is indicative of the strength of the market for all lines of finished products. Steel bars now are being firmly held at 2.25c for forward shipment, but considerably higher prices are being paid for prompt delivery. Bar iron has been advanced to a minimum of 2.40c by leading makers in this district, with some concerns refusing to shade 2.50c.

Mills Out of the Market

Buffalo, Feb. 29.—Mills and agencies of the Buffalo district report generally that their order books are filled to such an extent for tonnages that will take practically their entire rolling capacity for the year, that even the appeals of customers of long standing have to be turned down, as there is little disposition on the part of the producers to enter into contracts that will commit them to deliveries forced beyond the end of the year on the present market prices.

Want Mill Protection

Philadelphia, Feb. 28.—As practically all the steel bar makers are unwilling to enter into future contracts at this time, some buyers now are bringing pressure to bear to obtain informal promises from the mills of tonnages to be made available to them for last half on which the price is to be fixed later. In this way, the consumer feels he is providing some measure of security against possible shortages later. These informal assurances have been given by makers in certain instances and seem to have satisfied the consumer. As far as contracts go, the present official price of 2.25c, Pittsburgh, or 2.409c, Philadelphia, is practically nominal, as the makers are selling little at it. Where the buyers force sales upon the mills or early delivery is given, premiums are received without trouble. These lots usually are small. Such sales in the week were done in this territory at 2.35c and 2.50c, Pittsburgh. The large round market shows no developments of importance. One maker reports his last sale of a moderate tonnage for first half was at 4.00c, mill. A Philadelphia manufacturer has out a new inquiry for 600 tons of shrapnel steel for Russia. An Easton, Pa., shell maker has kept active an inquiry for 18,000 tons of 7½-inch blooms.

Eastern Bar Iron Up $3

Philadelphia, Feb. 28.—A continuing heavy demand is causing the rise in eastern bar iron prices to be sustained. Eastern mills, effective Feb. 25, again advanced their prices $3 a ton to 2.40c, Pittsburgh, or 2.559c, Philadelphia. The eastern market on iron bars is keeping well in advance of that on steel bars. Deliveries by the mills still are dropping back. On the common sizes of rounds and squares from ½ to 1-inch, shipments now are promised in about two months. Some of the other sizes, where the demand is never so strong, can be obtained in three to four weeks.

Bar Iron Up $2

Chicago, Feb. 29.—Makers of bar iron have advanced their prices, but still are willing to sell at a figure which would allow shipments to eastern users in competition with makers in the east. Tonnages for prompt delivery can be

(*For complete prices see page* 516.)

booked at 2.00c, Chicago mill, but for second quarter material the quotation is 2.10c. No quotations are named beyond July 1 and contracts for more than three months are not being taken.

Considerable inquiry is being received from eastern consumers, who are unable to obtain material from mills in their territory and are looking to western mills to help out. The latter are not anxious to cover their production for buyers who ordinarily do not patronize them and practically nothing is being booked on these inquiries. A number of eastern railroads have been making strenuous efforts to place tonnages with bar iron makers in this territory, but so far without avail.

Hoops, Bands and Shafting

Pittsburgh, Feb. 29.—Cold rolled strip steel products have been put up $5 a ton this week by manufacturers in the Greater Pittsburgh district. No trace of sales below 5c can be found and some material is commanding 5.25c. Manufacturers are refusing to sell for delivery beyond July 1.

Pipe Advanced

Standard Black Marked up $2 and Galvanized $4 per Ton

Pittsburgh, Feb. 29.—Under date of Feb. 29, the National Tube Co. sent out revised cards showing an advance of one point, or $2 a ton in the price of standard black and two points of $4 a ton in the price of standard galvanized steel pipe, 12 inches and under; all sizes over 12 inches in diameter were put up $4 a ton and 7 to 8-inch extra strong plain and black pipe was advanced $6 a ton. Oil country goods were advanced from 2½ to 5 per cent. The last previous change in the price of wrought steel pipe was made Feb. 15, when all sizes, 12 inches and under, were advanced $2 a ton. Since Jan. 1, most sizes of wrought steel pipe have been advanced $8 a ton. Steel boiler tubes, under date of Feb. 29, were advanced one point, or $2 a ton and now are commanding $8 a ton above prices prevailing Jan. 1.

Manufacturers of wrought iron pipe on Feb. 29 issued new cards, showing irregular advances in price. Standard black iron pipe has been put up $2, standard galvanized, $4 a ton. Prices of extra heavy iron pipe were unchanged, but double extra heavy material was put up three points, or $6 a ton by wrought iron pipe manufacturers. Iron boiler tubes likely will be advanced $2 a ton this week.

Demand for tubular goods is decidedly heavy. The Philadelphia Co. has placed orders for 1,700 tons of steel line and 2,000 tons of iron line pipe. An Ohio gas company is negotiating for 50 miles of 6, 8 and 10-inch line pipe and scattering inquiries involve 35 miles of 6-inch steel and 35 miles of 8-inch steel line pipe for western shipment.

Foundry Coke

For Prompt Delivery Sold at $4 and Higher—Irregular Shipments

Cleveland, Feb. 29.—At least one sale of a car of Connellsville foundry coke for prompt delivery has been made at $4, ovens. The usual quotation for the last half is $3.75, while $3.50 is quoted on contracts for one year, beginning July 1. Sales of the past week include 20 cars of by-product coke at $6.25, delivered. Some Stonega coke is being sold in this city.

Coke Situation Unchanged

Pittsburgh, Feb. 29.—The market for Connellsville furnace coke shows little or no change in position this week. Despite the fact that shipments are slow and irregular, not much demand for spot blast furnace fuel is reported. Scattering sales on the basis of $3.75, ovens, have been made the last few days, although the $3.50 quotation for spot 48-hour coke has not disappeared. The contract market continues quiet. Demand for foundry fuel is heavy and some tonnage is commanding more than $4, ovens. Foundries throughout the country are enjoying considerable activity. *The Connellsville Courier* for the week ending Feb. 19, says production of coke was 418,287 tons, a decrease of 23,022 tons, compared with the week before.

Cokemakers are interested in the request of Capt. W. Harry Brown to have his Alicia coal mines, near Brownsville, Pa., extended the freight rate applying to the Pittsburgh freight zone, which is 15 cents a ton lower than that affecting his plant. A plant within a short distance of the Alicia properties is included in the Pittsburgh freight zone. Demand for coal for by-product coke ovens lead to the request made by Capt. Brown. Special Examiner Burnside of the insterstate commerce commission, heard testimony Monday and Tuesday at the Pittsburgh chamber of commerce.

Deliveries Delayed

New York, Feb. 29.—Coke deliveries in New England territory are subject to tie-ups because of a fluctuating condition of freight embargoes being lifted and restored by the railroads. New England consumers have made further purchases of local by-product coke from the Boston district around $8 per ton, ovens, which compares with $14 per ton, paid at the height of the recent famine produced by the blocking of shipments originating outside, by the freight embargoes. Considerable buying of early Connellsville foundry coke for this district and New England continues at $4 to $4.25, ovens. A number of further contracts have been placed for foundry coke at $3.50, Connellsville, for the year beginning July 1 and at $3.75 for six months.

(For complete prices see page 516.)

Foundry Buying Begins

Cincinnati, Feb. 29.—Users of foundry coke are beginning to cover for yearly contracts, beginning next July, with the result that buying of this grade is good at present. Spot furnace coke is very scarce and usually demands a premium. Several furnaces are asking for shipments heavier than those specified in their contracts with the ovens, which is keeping consumption slightly in excess of production in the Wise County, Pocahontas and New River districts. Prices are very firm. New River foundry coke is given at from $3.50 to $4, ovens, Wise county furnace coke at from $3 to $3.25, ovens, and Pocahontas foundry at $3 to $3.50, ovens.

Seek Tin Plate

Buyers are Flooding Mills With Demands for Coated Product

Pittsburgh, Feb. 29.—The market for tin plate is exceptionally strong. The demands both of domestic and foreign consumers have been steadily increasing the past few weeks, many of the mills reporting that they have never encountered such a volume of inquiry. Prices are firm at $4 to $4.25, with most of the independents quoting at the maximum. While the export demand has been largely responsible for the advancing market, domestic consumption has gained steadily. With this country called upon to supply a greatly increased proportion of the world's demands, some producers predict that still higher levels will be reached. The activity in tin plate has brought into operation some sheet mills, which had been idle owing to the slackened demand for light gage sheets. One independent has sold 500 boxes during the past few days at $4.25.

New Manager of Sales

George Israel, formerly purchasing agent of the Central Steel Co., Massillon, O., has been made manager of sales of that company.

The Grasselli Chemical Co., Cleveland, has completed plans for the erection of a plant at Niles, O., where property was purchased about a month ago. W. N. Kratzer & Co., Pittsburgh, will fabricate the steel for the building.

Scrap Deliveries Delayed

By Railroad Embargoes—Declines in Some Centers Checked and Market in General Stronger

Philadelphia, Feb. 28.—Widespread freight embargoes are blocking the way for business in the old material market in this district and the volume of trading is reduced. General embargoes now are in effect against Philadelphia, Coatesville, New England and on all eastern shipments originating west of Pittsburgh, while one road will not receive material consigned here from the south and another has embargoed Burnham, Pa. The effect of these conditions is to put the market in an abnormal position where neither buyers nor sellers are inclined to act. The consumers have ample stocks and consequently are in no pressing need of making new purchases. The more active market at Pittsburgh has helped sentiment in this district and dealers are not so willing to sell. The Cumberland Valley railroad has sold to Luria Bros. a 2,200-ton wrought iron bridge across the Susquehanna at Harrisburg at a price of about $20 on cars there.

Demand for Scrap Steel

Buffalo, Feb. 29.—The feature of the Buffalo scrap market is the appearance of a stronger demand for heavy melting steel in addition to the inquiry for large tonnages that came into the market a week ago. The negotiations under way will represent the movement of a large tonnage of this line of old material. Consumers that have been out of the market for a considerable time are not making inquiries to line up stocks against their needs in the near future. Dealers report that the market for practically all of the lines is decidedly strong and that the prevailing attitude is one of waiting for something to happen, and the change anticipated is one of advances in prices.

The only commodities in the list that have shown a softening tendency are cast scrap and old car wheels. The schedule on the former has declined 50 cents per ton, while the latter line remains for the present at the previously quoted price.

Better Tone

Pittsburgh, Feb. 29. — After a rather active buying movement, in which the Carnegie Steel Co. participated, prices of old material reflect moderate strength. The Carnegie company purchased considerable heavy melting stock, which now is being held at $17.50 by most dealers. Other grades of iron and steel scrap are more active than at any time since Jan. 1, and middlemen predict that sharp advances will be made this month. The Baltimore & Ohio railroad and the Pennsylvania railroad are asking bids on miscellaneous grades of scrap.

Cleveland Market Stronger

Cleveland, Feb. 29.—A much stronger tone is being evidenced in the Cleveland scrap market. The lull of the past ten days has given way before the news from the Pittsburgh district of a considerable purchase of scrap by an interest in that city. While two mills in the Cleveland territory maintain the embargoes put into effect over a week ago, conditions are improved, though to date no price changes have been noted. There is a pronounced attitude on the part of the dealers that a buying movement has started and the condition of many yards adds to the belief that when the purchasing begins in earnest, that prices will be higher. One local dealer who maintains an extensive yard has little more than 500 tons of material on hand and this condition gives rise to the opinion that scrap will not be so plentiful as heretofore. Heavy melting steel is quoted gross tons, Cleveland, $16.25 to $16.75, unchanged from last week.

Scrap Holding Steady

Chicago, Feb. 29.—After numerous declines, the Chicago scrap market appears to be holding its own better than for several weeks. In some instances, slight advances are registered, but this is from sentiment most largely, as no buying of any moment is being done. Large consumers have maintained their reserves by occasional buying of bargains and some have sufficient scrap to cover their needs for entire first half. Brokers believe a buying movement is imminent and this is having the effect of strengthening prices somewhat.

Steel turnings are being marketed much in excess of usual quantities, work on munitions apparently throwing an unusual tonnage of this material on the market. The price is weak, $8 per net ton being the usual quotation.

Only two railroad lists are now current, the Chicago & Northwestern railroad offering 2,250 tons, which includes 300 tons of No. 1 cast. The Baltimore & Ohio railroad is offering 13,000 tons, but not much of this probably will be marketed in Chicago. This list includes 5,000 tons of No. 1 steel rails, 1,000 tons of No. 1 wrought, 500 tons of car wheels, 600 tons of No. 2 wrought and 300 tons of steel car axles.

(*For complete prices see page* 516.)

Firmer at St. Louis

St. Louis, Feb. 29.—A firmer tone has come to the scrap market in this district within the last few days, evidently caused by the activity in pig iron. While prices to consumers have not advanced, the railroad lists, which closed recently, all went at higher levels. Relaying rails are very active and the supply is rather limited. No lists are out this week.

Better Demand

Birmingham, Ala., Feb. 29.—There has been no further slump in the old material market, and with the last reduction in prices has come a better demand for cast scrap and steel of all class; also heavy cast scrap. Dealers report that fair tonnage was booked the past week, but that sellers of scrap do not manifest much interest in the sale of miscellaneous scrap. Following prices per net ton f. o. b. cars, Birmingham, are quoted:

Old steel axles	$13.75
Old steel rails	12.25
No. 1 steel scrap	10.25
No. 1 cast scrap	9.75
Heavy cast scrap	10.25
Stove and light cast	8.50
Old car wheels	10.50
Tram car wheels	10.00

Scrap Iron Uncertain

Cincinnati, Feb. 29.—The large surplus of iron and steel scrap available throughout this territory is keeping the market in an uncertain condition. Demand is better than for more than a month, but a good buying movement of several weeks' duration will be necessary to put dealers in a position to advance prices, which remain unchanged. Sales of heavy melting steel are good at from $13.75 to $14.25, per gross ton. No. 1 machine cast is quoted at from $11.50 to $12 per net ton, and mixed cast at from $10.25 to $10.75 per net ton.

Nuts, Bolts and Rivets

Pittsburgh, Feb. 29.—Advanced prices of nuts, bolts and rivets, announced a week ago, have been firmly established in this district and it is likely that further advances will be made this month. Domestic demand is decidedly heavy and considerable material is being sold for export.

The Avery Co. at its annual meeting held at Peoria, Ill., recently re-elected its board of directors with two exceptions. C. W. Mathews was elected in place of F. J. Johnson and A. Y. Bartholomew in place of Henry Robertson.

To Make Ferro at Chicago

One Stack of Iroquois Iron Co. to be Utilized Under Contract With Miami Products Co.

Chicago, Feb. 29.—An arrangement has been entered into between the Miami Products Co., a Chicago corporation, and the Iroquois Iron Co., whereby "A" stack at the latter's blast furnace plant at South Chicago is to be used by the former for the production of merchant ferro-manganese, spiegeleisen, ferro silicon and other ferro alloys. The principal activity at present will be the production of ferro-manganese from ore brought from Southern California. It is expected that about 2,000 tons of this alloy will be made during the present year and if conditions warrant, ore may be brought from Brazil and the stack operated on a more continuous scale than is now planned.

The stack is admirably suited to this use although not as well fitted as more modern stacks for the production of pig iron. Some improvements will be added, including a gas washer, and the blast will be turned on in about 60 days.

The Miami Products Co. is a mining and smelting proposition which has been in existence for some time and which recently was incorporated in Illinois with $100,000 capital stock.

Francis H. Hardy is president, H. A. Brassert, vice president, and J. W. Miller, secretary-treasurer. Mr. Hardy, Mr. Brassert and Chester D. Tripp form the board of directors.

Lower Grades Put Up $3

Pittsburgh, Feb. 29.—Effective Feb. 28, manufacturers of lower grades of ferro-silicon advanced prices $3 a ton to $31, furnace, for No. 10 per cent. This is the first advance announced by makers of this alloy this year. Books for delivery the third and fourth quarters have been opened and it is likely that active buying will feature the market the next few weeks. Demand for 50 per cent ferro-silicon continues heavy, but no new buying is reported. The situation for ferro-manganese is not improved to any extent and it is probable that some plants will have to close down for an indefinite period, unless material can be obtained. Spiegeleisen is being held at $50, furnace, and some selling is reported at that figure.

Conditions Still Acute

New York, Feb. 29.—Renewed selling of ferro-manganese for last half delivery by English producers during the past week has failed to take off the edge of the acuteness of the shortage in this alloy and prices still are rising. The additional tonnage for last half which the English producers, through their agents, speedily disposed of, when they again entered the market the past week, totaled about 10,000 tons. A large independent steel maker in the Pittsburgh district is credited with taking about 3,000 tons of this amount. The bulk of the business was placed at the regular contract price of $150, seaboard, but several thousand tons for last half were sold by one maker at $155, seaboard. Most of the business was done on offers made by the consumers and put up to the producers some days previously and little of it found its way into the open market. The tonnage offered was limited by the makers, and it having been speedily disposed of, the latter again withdrew from the market and are not offering for last half at the present time. Some thousands of tons of unsatisfied inquiries remain in the market.

The market continues bare of offerings of 80 per cent ferro-manganese for spot, upon which the prices are $225 to $250, seaboard. Lots of 100 tons or more of English for April delivery have been sold at $200, seaboard, and for May and June at $175, seaboard. Sales of low-grade domestic ferro-manganese and spiegeleisen continue to be made on a unit of manganese basis showing a higher equivalent for 80 per cent than the former prices. Domestic ferro-manganese containing under 50 per cent manganese, has been sold for early delivery at $3.50 per unit of manganese, at the furnace, or on the basis of $280 for 80 per cent. Domestic makers now have advanced their price for such material to $4 per unit. Spiegeleisen of 16 per cent quality has brought $50, at the furnace, which remains the official quotation for standard 20 per cent. Some tonnage to be made by the Pueblo, Col., producer, running 30 to 35 per cent manganese, has been marketed at $85, furnace. This producer now is holding back on further sales of this metal and is talking of $90, furnace. A central Pennsylvania steel works was the purchaser of 1,500 tons of domestiv spiegeleisen for forward delivery.

Arrangements continue to be made for increasing the domestic production of ferro-manganese, as English shipments still come forward slowly.

Pamphlet on Tungsten.—Carlisle & Co., 74 Broadway, New York, have prepared for free distribution a booklet entitled "Tungsten, Its Properties and Uses". It is complete and contains extracts from the United States geological survey. It discusses prices, uses of tungsten and other interesting matters.

(*For complete prices see page* 516.)

Forging Billets

And Blooms Sold at Very High Prices in the East.

Philadelphia, Feb. 29.—Shortage of the supply continued to bring forth some extraordinary prices for semi-finished steel for assured delivery. A western Pennsylvania maker reports a sale of 2,500 to 3,000 tons of large forging blooms for comparatively early delivery to a domestic consumer munitions, at $85 base. Pittsburgh Extras for size and pulling tests are to be added. An eastern Pennsylvania producer has sold to regular customers forging billets at $65, mill. Eastern and western Pennsylvania makers have taken recent orders for chrome-nickel and chrome-vanadium steel billets at $110 to $125, mill. Odd and irregular lots of semi-finished steel continue to command high prices. A Cumberland, Md., buyer who has been in the market for 9,000 tons of sheet bars for forward delivery is meeting with great difficulty in placing this order. There is an increasing amount of inquiry for billets and other semi-finished material for shipment after July 1, but eastern makers are not inclined to quote ahead at present. The mills talk higher prices for third quarter, and some of them want $50, mill, for open hearth rolling billets as against $40 to $45, mill, the present nominal figures.

Billets Sell Above $40

Youngstown, Feb. 29.—The first sale of open hearth billets for immediate delivery made in some months was concluded yesterday. About 150 tons were disposed of to different consumers, at prices above $40. The rapidity with which the sales were concluded gives a clear indication of the present strength of the market. The embargo placed on New England shipments yesterday noon left one interest with three loaded care on the tracks. A few minutes work on the telephone sufficed to dispose of the lot. Little tonnage of either sheet bars or billets is available for sale for several months ahead. Efforts of some sheet mills to cover their second quarter requirements have been unsuccessful. The belief is generally expressed that mills entering the market for last half delivery will be con-

fronted with a quotation of $40, while the tonnage available will be insufficient to permit capacity operations. The market for sheets, bars and billets in both bessemer and open hearth grades is firm at $40.

Advanced at Pittsburgh

Pittsburgh, Feb. 29.—An anxious consumer a few days ago offered $40, Pittsburgh, for 3,000 tons of sheet bars, but was unable to close a contract, so far as can be ascertained. Both bessemer and open hearth sheet bars are being held at $40 and billets are commanding from $38 to $40 a ton at the mill in this district. Consumers, who covered requirements early in the year, are obtaining material at considerably less than these figures and probably will be able to cover third quarter requirements at slightly below prevailing prices. It is apparent, however, that material for prompt delivery is decidedly scarce and high in price.

Cast Iron Pipe

Southern Maker Catering to Latin-American Trade

Birmingham, Ala., Feb. 29.—The volume of business transacted by the manufacturers of cast iron pipe the past week was very satisfactory. One interest is particularly catering to the Latin-American trade and is sparing no expense to obtain a true status of affairs in those countries—just how to ship, and what is wanted by them. Interests report that inquiries from the central west were larger the past week than for some time past, the cities in that section probably anticipating their needs after the severe winter shall have passed. Following prices are quoted per net ton f. o. b. cars, plants, for standard pipe: Four-inch to 6-inch, $28; 6-inch and up, $25; with $1 per ton extra for gaspipe and 16-foot lengths.

Affected by Embargoes

New York, Feb. 29.—Freight embargoes which have obstructed the regular movement of trade in eastern territory for some weeks past have had their effect on cast iron pipe. Municipalities and other buyers, especially in New England, have been deferring their purchases on this account. The foundries look for good offerings when freight conditions are cleared up. Business in pipe for this season of the year, however, is quite fair and February has shown more tonnage than any corresponding month in several years. Prices are holding well at $29.50, New York, for 6 and 8-inch and at $32.50, New York, for 4-inch. R. D. Wood & Co. have taken 2,500 tons of 4 to 30's for Boston. Considerable export inquiry is coming out, but there are few sales of this kind.

Cast Pipe is Steady

Chicago, Feb. 29.—Although pig iron quotations are firming and higher prices appear to be imminent, cast iron pipe makers have not increased their quotations.

The United States Cast Iron Pipe & Foundry Co. has taken 600 tons at Mason City, Ia., and is low bidder on 4,650 tons at Cincinnati, the award not yet having been made. Bids were to be opened Feb. 29 at Detroit on 5,500 tons and the same day at Columbus, O., on 1,800 tons.

Warehouse Prices

Again Marked Up in Some Cities — Record Breaking Business.

Cincinnati, Feb. 29. — Warehouse prices on shapes, plates and steel and iron bars have advanced about $3 per ton. Steel and iron bars are now given at from 3c to 3.50c, and plates and shapes at from 3c to 3.15c, all Cincinnati basis. Mill prices on sheets are firm at 2.80c for black No. 28 gage, 5c for galvanized No. 28, and No. 10 blue annealed at from 2.80c to 3c, all Pittsburgh basis. Warehouse prices on sheets are as follows, Cincinnati basis: Black No. 28, 3.65c; galvanized No. 28, 5.30c, and blue annealed No. 10, 3.25c to 3.50c.

Warehouses Advance Again

Chicago, Feb. 29.—An advance of $3 per ton on bars and shapes, and $4 per ton on plates was made effective Feb. 28, following a flat advance of $3 per ton on all three products Feb. 22. This advance more than equals the mill advance of $5 per ton made Feb. 18. This advance applies to Chicago, St. Louis and St. Paul in equal measure.

Shafting at High Prices

Philadelphia, Feb. 28.—Small lots of shafting from warehouse are bringing high prices in this district. Sales at the net list price and at 10 off have been made. Large rounds are selling around 3.50c at the warehouse. Plates have been advanced from store to 3.50c. Structural shapes and ordinary steel bars are at 2.85c.

Largest Sales on Record

Cleveland, Feb. 29.—One Cleveland jobbing house which has been in business many years sold the largest tonnage from store last month of any month in the history of the concern, and other sellers who have not been in business so long had similar experiences. It was expected that another advance would be announced early this week, but prices continue unchanged for the present. It is probable, however, that there will be an advance within a few days.

(For complete prices see page 516.)

Metal Markets

Have Been Quiet—Spelter Dull, But Prices Fairly Steady.

New York, Feb. 29.—The metal markets generally have been quiet during the week, activity being reflected principally in lead. Independent lead producers have booked a fairly large business, divided between foreign and domestic consumers, at advancing prices. Some of these interests now are asking 6.60c, New York. The American Smelting & Refining Co., despite expectations of the trade, has not yet declared an advance, and continues to quote 6.30c, New York, and 6.22½c, St. Louis. The outside market is quoted at 6.50c to 6.60c, New York, and 6.35c to 6.45c, St. Louis.

Very little activity has featured the copper market. Second hands, by reason of the lull in demand and a weakening in London prices, last week began to offer small lots of electrolytic and ordinary lake copper at around 28c to 28.25c, cash, but these offers did not have much effect on the market on account of the sold-up condition of producers. Today the quotations on small lots of spot in the outside market range between 25.25c to 25.50c, cash. First hand prices continue as follows on June and July shipment: Electrolytic, 27.25c to 27.50c, delivered 30 days; best brands of lake copper 28.50c, cash; ordinary lake copper 27.75c, cash; arsenical lake copper 27.50c, cash. Ordinary casting copper is quoted at 26.50c to 27c, cash.

Spelter has been dull, but prices have remained fairly steady. Slightly more life was displayed in the market today and sales of prime western were reported at the following figures: Spot 20.50c, St. Louis; March 20c; April 19c; second quarter 18s. These prices about indicate the market. Brass special spelter for prompt shipment is held at 22.75c to 23.25c, St. Louis.

The tin market has been considerably disturbed by the delay in getting licenses for exporting tin from England, with the result that sellers here are disposed to hold on to their supplies. Yesterday the market on spot was bid up to 50c, and today there were sales of limited quantities of spot at 48c. The market is in a waiting state and not much inquiry is reported.

The antimony market also has been quiet during the week, only scattered sales being made. Domestic antimony for spot delivery is quoted at 43.50c to 44c, New York, while quotations on Wah Chang's W. C. C. brand are as follows: Spot 44c to 44.50c, duty paid; March shipment from China, 34c, in bond; April shipment from China, 33.25c to 33.50c, in bond.

The outside aluminum market reflects considerably higher prices due to the scarcity of material. This is caused by the reluctance of consumers in reselling material, since these interests are afraid of being caught short of stocks on account of the delays attendant upon freight transportation. The market on No. 1 ingots in carloads for prompt shipment is quoted at 61c to 63c.

The Rockford Milling Machine Co., Rockford, Ill., has increased its capital from $50,000 to $200,000.

Electric Control of Machine Tools

HAND STARTERS for machine tools have now been largely displaced by remote-control automatic starters. The author points out several advantages of the newer method and describes the various types of automatic starters, as well as recent developments of motor control as applied to the principal machine tools where engineering problems are most complicated. The increased efficiency of operation under this system of control makes the article unusually valuable

BY L. C. BROOKS

THE application of electric control to individual machine tools is considered to be one of the most important forward steps in the improvement of machine shop efficiency. Prof. W. F. M. Goss some time ago declared it his belief that the machine tool of the future is to be an individual motor-driven machine, a machine in which we shall not see pulleys, belts or gears. This prophecy is surely being fulfilled. Six years ago it was pointed out that for work requiring adjustable speed motors, the direct current motor alone was applicable. The same is true still, if the desired speed increments are small. However, very satisfactory results are being obtained with alternating current in large installations in steel mill and other heavy duty work of large capacity.

In the early application of electric motors to machine tools, the motors were started by hand starters, either of the dial or the drum type, the former usually being unprotected. Some of us vividly recall the scene of an aged joiner attempting to start a high-speed machine. As the starting arm of the rheostat drew near the running point, his trembling was so great as to cause the starting arm to break contact. The result was a heavy arc on the starter and a burned hand for the operator. However, these conditions are now entirely reversed by safety-first requirements and the employment of remotely controlled automatic controllers. During the past year, the American Institute of Electrical Engineers held a series of meetings under the auspices of the Industrial Power Committee. The subjects treated included the characteristics of electric motors; factors involved in motor applications; fields of motor application and controllers. These articles contained a vast amount of valuable data and contributed considerable important

A paper read at the recent annual meeting of the American Society of Mechanical Engineers, New York. Discussions of Mr. Brooks' paper by H. F. Stratton and H. D. James, will be published in the two following issues of *The Iron Trade Review*.

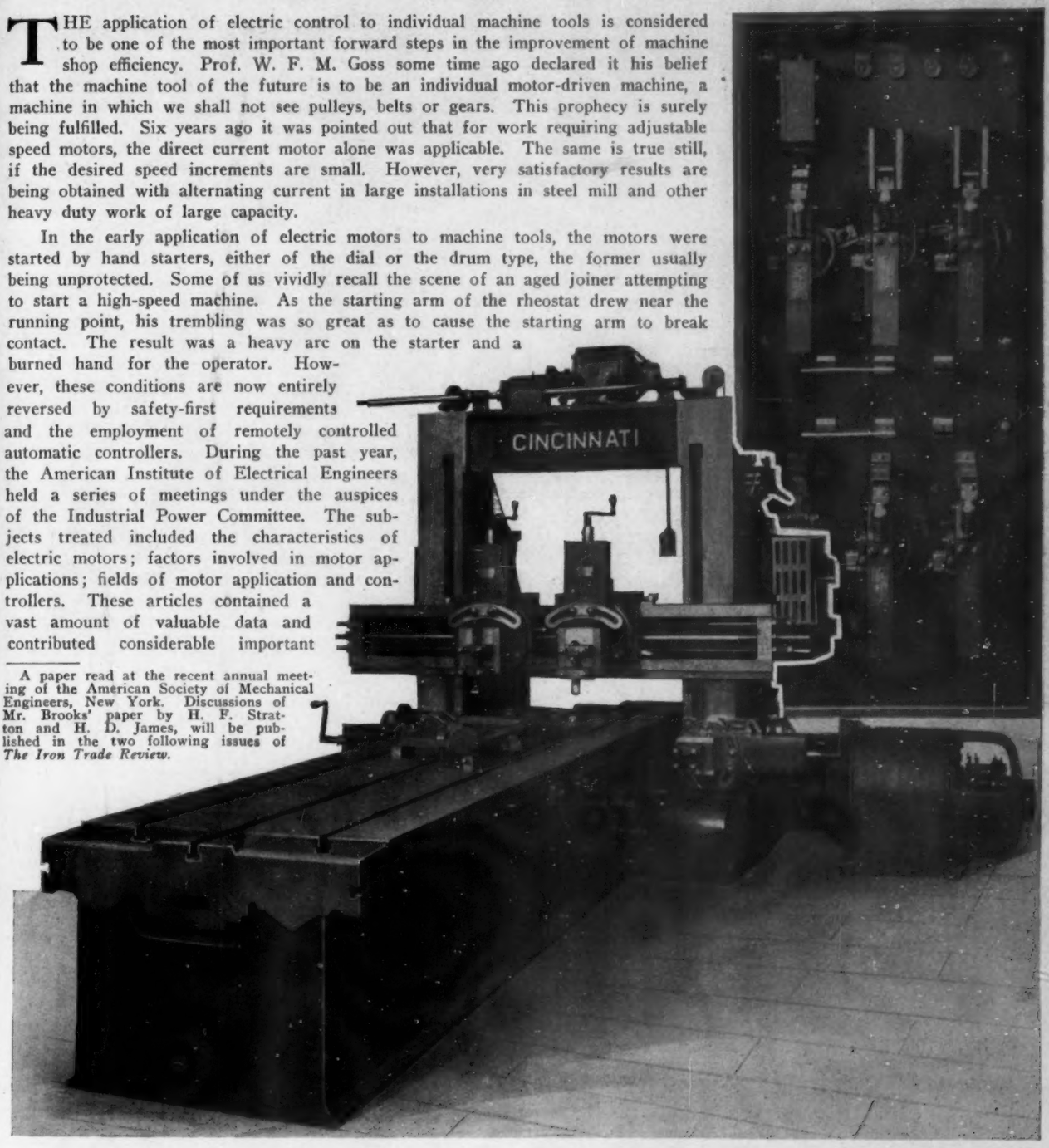


FIG. 1—CINCINNATI 48-INCH PLANER DRIVEN BY 20-HORSEPOWER, 230-VOLT MOTOR. FIG. 2—WHEEL LATHE CONTROLLING PANEL FOR 200 AMPERES

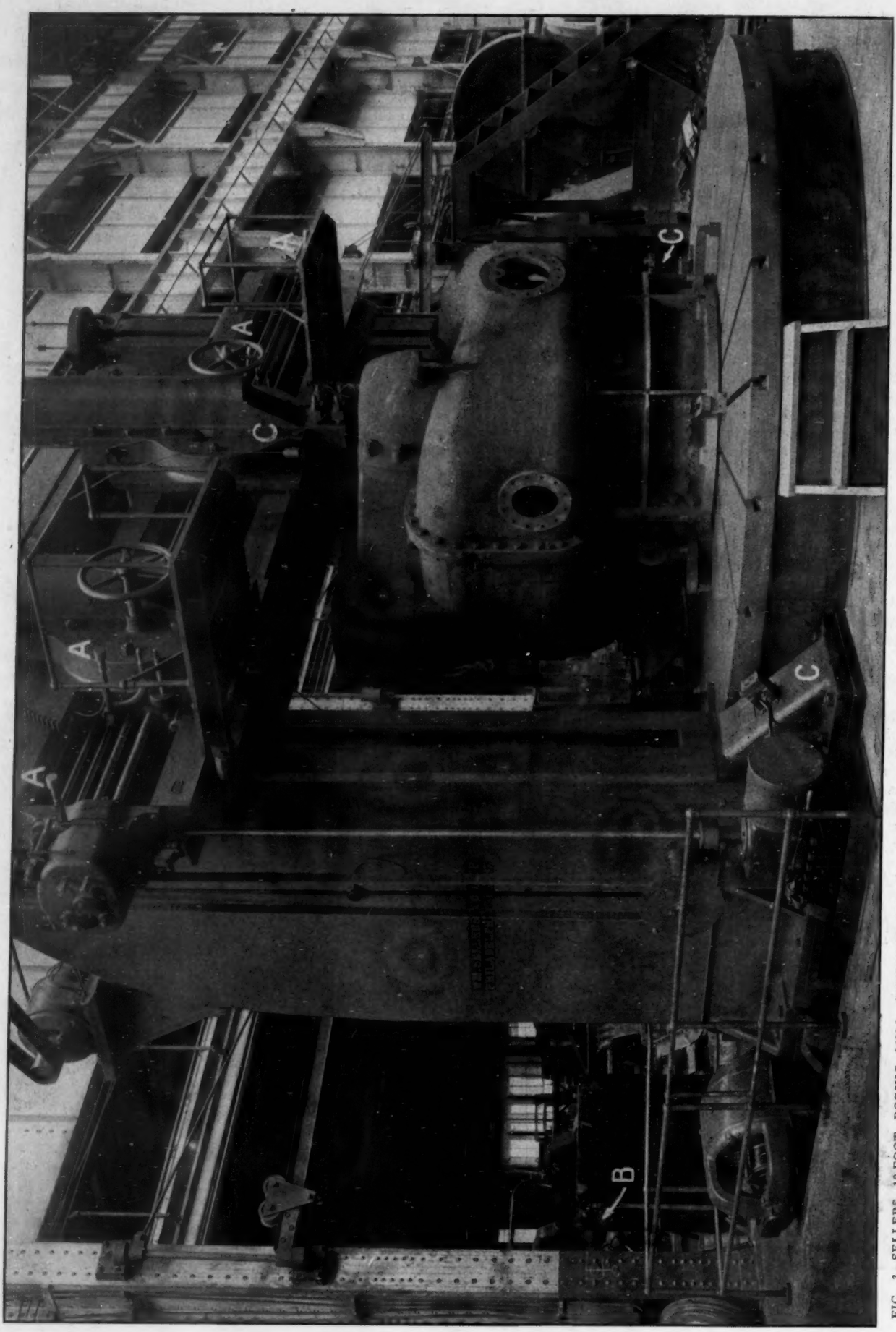


FIG. 3—SELLERS 18-FOOT BORING MILL OPERATED BY 7½ AND 50 HORSEPOWER MOTORS CONTROLLED BY PANEL. *A* IS RAPID TRAVERSE AND FEED CONTROL STATION; *B* IS MOTOR PANEL AND *C* IS MAIN MOTOR CONTROL STATION

information relative to their subjects and to present practice.

The importance of control appliances can best be emphasized by quoting a very prominent machine tool builder: "In analyzing the various elements of machine tools, the question naturally arises, wherein can they be improved? There are many ways. First, let us consider the question of control. Control is the essence of machine tool operation. It plays the largest part in production work. Control is everything * * *"

While there are a number of instances and special locations where dial or drum type hand starters are more applicable, we have reached the time when automatic starters, remote controlled, are the most suitable, with the possible occasional exceptions of the reversing switch. The principal advantages of automatic control are as follows:

The use of manually-operated controllers may cause undue stresses on the motor, especially on rapid reversing equipments. The operating switch, or push button, is easily attached to the machine and the main panel may be located at a distant point, out of the way. The manufacture of automatic appliances is now a well founded art, and no longer an experiment. A considerable increase in the capacity of the machines is obtained. The starting time is automatically regulated to suit the load conditions on the motor. Accurate stopping points are obtained by the application of *dynamic braking,* which consists in connecting a resistance across the armature circuit in the off position of the starter, the stored energy of the armature being dissipated as heat in the resistance. It permits the use of operators not specially trained. It entirely removes the element of thought from the mind of the operator, who has simply to operate the master switch or push button in the desired direction and need not think about drift points, safety features, etc.

The three general types of automatic starters are as follows:

Time element, wherein the starting resistance is cut out in a fixed period of time. This type is not adapted to conditions of varying starting load.

Counter electromotive force, wherein the starting resistance is cut out by magnets actuated by the counter electromotive force of the motor. The reliability of this system is decreased by the fluctuation in line voltage, except in the case of motors of small capacity, though it has worked very well in elevator work. Fig. 12 shows a connection of a counter electromotive force starter with one step of starting resistance. The contactor coil is connected in multiple with the motor armature and is so designed that the contactor will not close until the counter electromotive force of the motor has built up a predetermined value.

Current limit wherein the starting resistance cut out is regulated by the motor current. The current limit type of starters are of two kinds: First, with shunt wound magnet switches, actuated through series relays which will not close until the accelerating current has reduced to a predetermined value; second, with magnetic lock out switches or series contactors. These series type switches consist essentially of a series wound coil actuating the switch, the coil being in the motor circuit. The magnetic path in the switch may be so adjusted that the switch will not close until the current has reduced below a certain critical value.

A simplified wiring scheme of a series type of starter is shown in Fig. 13, in which contactor No. 1 is a shunt line contactor and contactor Nos. 2 and 3 are series accelerating contactors. No. 4 is a compound series accelerating contactor, with a shunt holding coil and an interlock in the control circuit of the holding coil. The control switch closes No. 1 contactor and the motor starts with all the resistance in the circuit. Contactor No. 2 closes as the current falls to some predetermined value, short-circuiting R1. As contactor No. 3 closes, due to the falling off of current, R2 is short-circuited; this contactor also short-circuits contactor No. 2 with its coil, causing No. 2 to open. In the same manner, contactor No. 4 closes, short-circuiting resistance R3 and dropping out contactor No. 3; in closing, contactor No. 4 establishes a circuit through the interlock for the shunt holding coil, thus insuring that contactor No. 4 will stay closed until the voltage fails or the control switch is opened.

All panels, whether for general starting duty, or for control of special machines, should be provided with a suitable enclosing case, for the protection of the appliances on the panel against injury, also for the protection of the operator against accidental contact with current carrying parts. With starters for motors of small capacity,

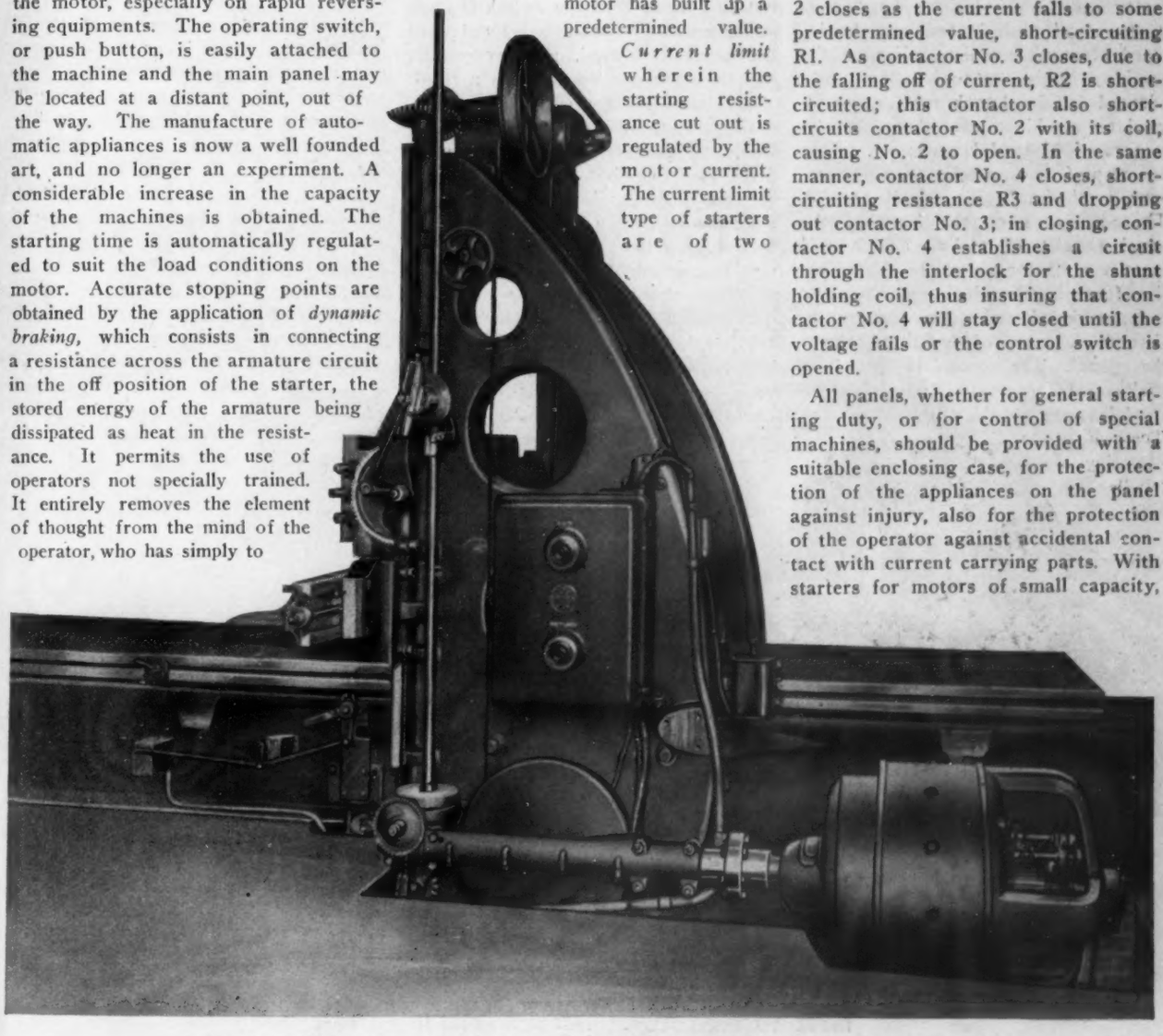


FIG. 4—NILES-BEMENT PLANER WITH REVERSING MOTOR DRIVE, 35 HORSEPOWER

the enclosing case should be fool-proof and should meet all the applicable safety first requirements. Under ordinary conditions, the control panels for motors of large capacity should be provided with small openings to allow for the radiation of heat from the current carrying parts. In many cases it will be found very desirable to make the enclosing case a part of the casting of the machine frames.

A starter for small motors of ¼ horsepower and less, where starting resistance is not necessary, is shown in Fig. 15. It consists of a line contactor, an overload relay, a field rheostat and connection board, mounted on the insulating base and enclosed in a safety first case, which is adapted for conduit wiring. This starter is arranged to start always with a full field on the motor, by simply turning the field rheostat handle to the extreme left, thus closing the line contactor, after which the rheostat handle may be turned to the point for the desired motor speed. If desired, an "emergency stop" push button may be located at any convenient point on the machine. This starter is especially adapted for headstock motors, woodworking machines, etc. A starter for motors of ¾ to 3 horsepower, where one step of starting resistance is necessary, is shown in Figs. 6, 10 and 11. The appliances on the front of the panel consist of a line switch and fuses, a contactor, a counter electromotive force accelerating contactor, and a connection board. The starting resistance is mounted on the back of the panel. The complete panel is enclosed in a safety first case, the chief features of which are as follows: The switch operating handle may

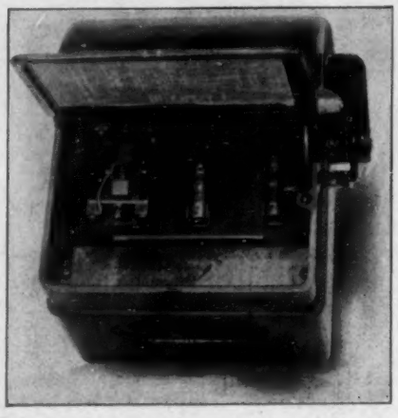


FIG. 6—DIRECT-CURRENT STARTING PANEL

be locked in position, thus preventing unauthorized operation. A hinged door is provided for the examination of the panel and for renewing the fuses. There is an interlock between the operating handle and the cover of the enclosing case, so that the cover cannot be opened until the switch is open and the switch cannot be closed until the cover is closed, thus preventing any injury to the operator as a result of accidental short circuits. This starter is arranged for push button operation, and the enclosing case may be fitted for conduit connection. For starters of larger horsepower, the arrangement must be somewhat modified to accommodate the additional accelerating contactors. A double pole line contactor should also be supplied. The questions of type of overload appliance and whether or not a dynamic braking contactor is necessary depend upon the application. The enclosing case should be of sheet steel, for appearance and light weight, and the interlocking features described above are not necessary. For general service, the starters for adjustable speed motors should be of the same general design as described for constant speed service. The appliances on the panel should include a double pole line contactor, the necessary accelerating contactors, suitable overload and no-voltage protection, a field accelerating relay, provision for starting the motor with full field, and for disconnecting the motor fields when the machine is not in use, a dynamic braking contactor, when it is required, and a protected terminal connection board. The starting resistance should be mounted behind the panel, except in the case of large sizes of motors, when it should be separately mounted. The field rheostat should be mounted separate from the panel, with the possible exception of small sizes of motors. The method of control should be at the panel or remote, as operating conditions require. For general reversing service, the starters should be of the same general design and requirements as given above for non-reversing starters, with such modifications as dynamic braking at the "off" position to protect the motor, and two double line contactors for the reversing. In small equipments, a double pole, double throw switch may be used for reversing.

The types of starters described above are applicable for all general service, as for pumps, fans, drill presses, grinders, milling machines and boring mills, except in cases where special features are desired. All automatic starters and control apparatus should be provided with protection from low voltage on the line, also from excessive overload. In all cases, except possibly pumps and fans and similar ma-

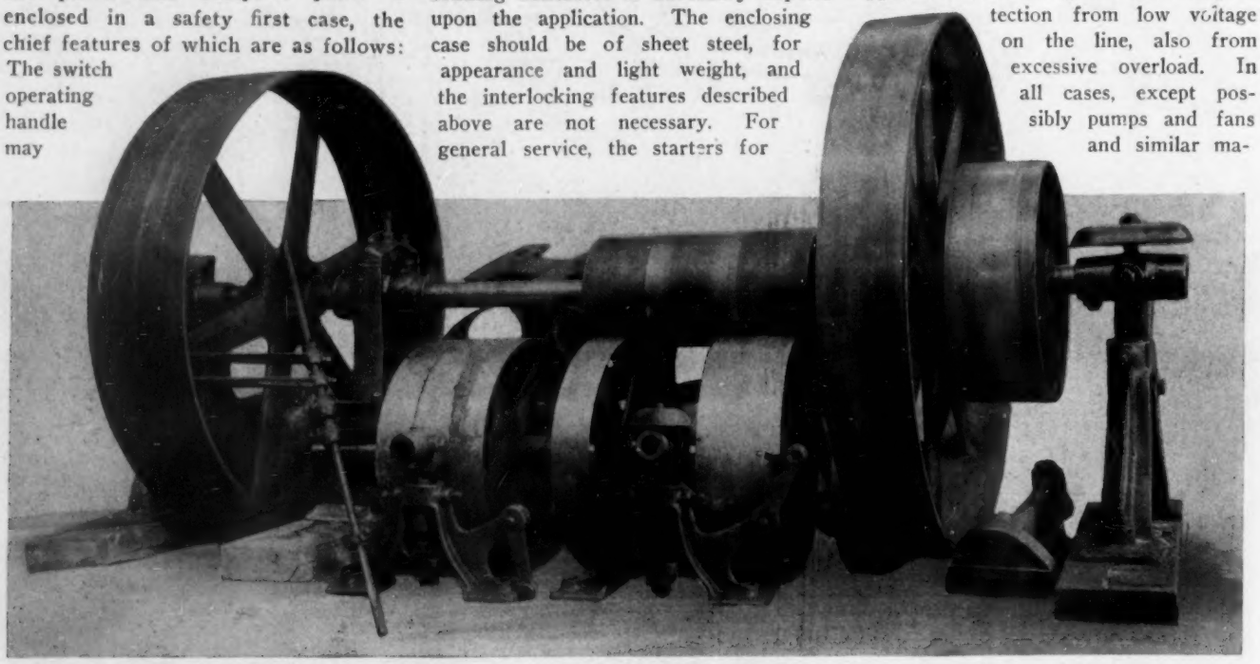


FIG. 5—MATERIAL DISCARDED FROM 72-INCH NILES-BEMENT PLANER WHEN CHANGING OVER FROM BELT DRIVE TO DIRECT-CONNECTED REVERSING MOTOR DRIVE

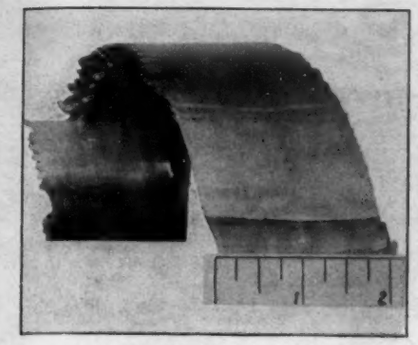


FIG 7—CHIPS FROM 38-INCH MOTOR-DRIVEN HEAVY DUTY PLANER

chines, these protections should be of such a nature as to disconnect the motor from the line, so that it may not be restarted, except by the operator at the starting station. For motors of more than 25 horsepower, the overload protection should be, preferably, an overload relay, either hand of electrically reset, as operating conditions require. For motors below 25 horsepower, the overload protection should be fuses, chiefly for economic reasons. The fuse capacity should conform to the requirements of the national board of fire underwriters. In many cases it will be preferable to have the line switch and fuses a part of the distribution system, separate from the control panel.

With adjustable speed motors, it is often desirable to set the field rheostat so that the motor will always operate at a certain speed. To accomplish this, in motors above 5 horsepower, the connections should be such as to start under full field and supply a field accelerating relay, which is actuated by the motor current; and the contacts, when closed, serve to short circuit the field rheostat. This permits starting under full field torque, and prevents an excessive peak current when the last accelerating contactor closes, as the relay alternately cuts the field rheostat in and out, as the motor increases from full field speed to the desired fast speed, which gives a fairly uniform load current on the motor. The field relay should operate within a reasonable range of current. On motors below 50 horsepower, with a speed adjustment of 2 to 1, this field relay is not necessary, except in special cases where the time of bringing the acceleration up to speed with 150 per cent load is many times that of the field constant. With adjustable speed motors of a range of greater than 2 to 1, provision should also be made so that the field resistance is not cut in until the last accelerating contactor has closed, thereby cutting out the last step of starting resistance. Provision should be made so that the motor fields are not energized when the machine is not in use. With adjustable speed motors, too, especially with a range of 4 to 1, arrangements should be such as to prevent a "pump back" when stopping the motor. On work which requires quick reversing, dynamic braking should be provided, at the "off" position of the starting switch. In many cases, as on planers and boring mills, a graduated dynamic braking of two or more points is necessary.

The individual appliances of control apparatus should be of the best possible quality applicable to the work of long life, and of relatively strong and rugged construction. By this is meant that with a contactor of 300 amperes capacity, it is reasonable to expect 1,500,000 or more operations without renewal of parts, while with a contactor of 25 amperes capacity, 500,000 operations would be satisfactory, owing to the relative lightness of construction and small parts. The design of bearing pins and surfaces should be such as prevent "freezing" and cause the minimum of wear. The appliances should operate satisfactorily under working conditions, with a voltage variation of 5 per cent above and 20 per cent below normal. They should also "wipe in" at or below the "pick up" voltage. The temperature rise on contacts and coils should not exceed 65 degrees under continuous operating conditions. All shunt wounds coils should be treated with

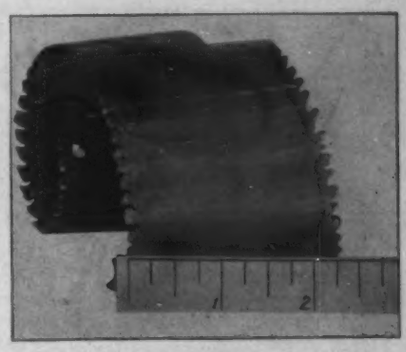


FIG. 9—CHIPS MADE BY PLANER DRIVEN BY 50 H. P. MOTOR

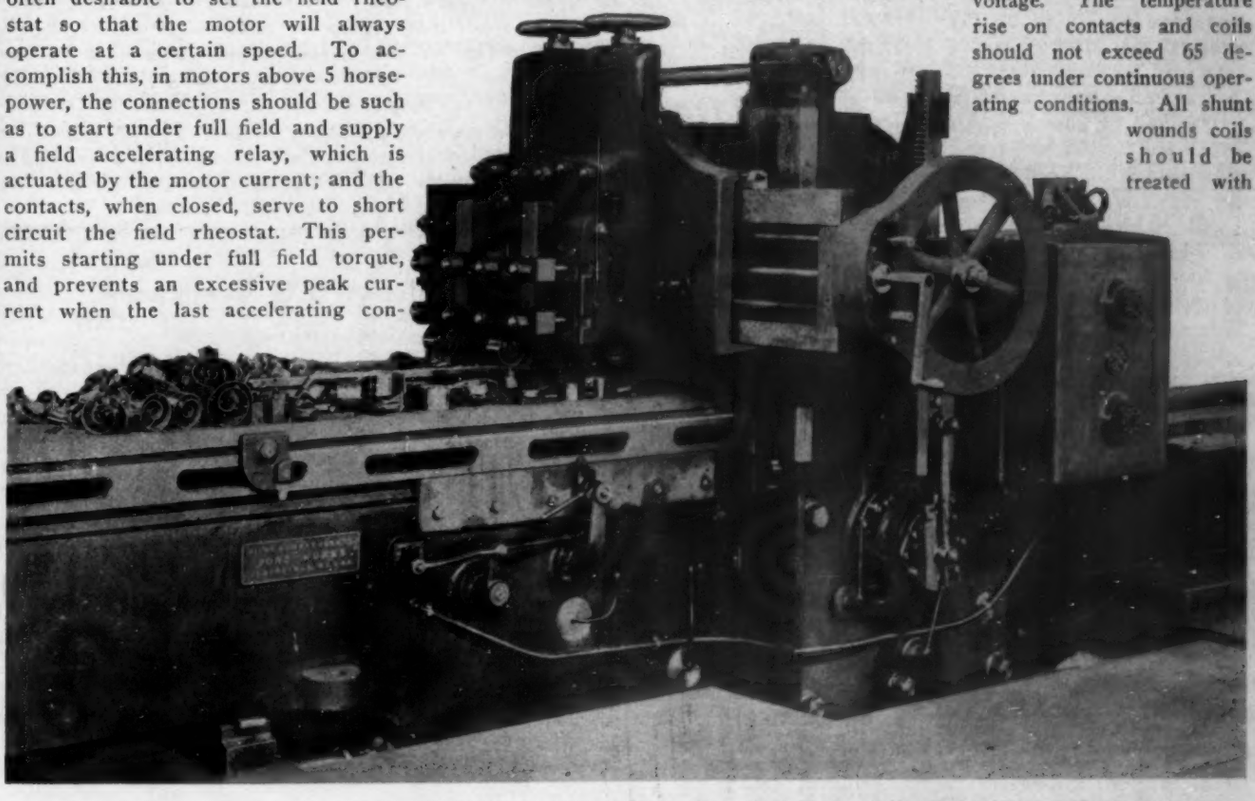


FIG. 8—GENERAL ELECTRIC CO., 50-HORSEPOWER REVERSING MOTOR DIRECT-CONNECTED TO POND 36-INCH x 20-FOOT HEAVY PATTERN FROG AND SWITCH PLANER

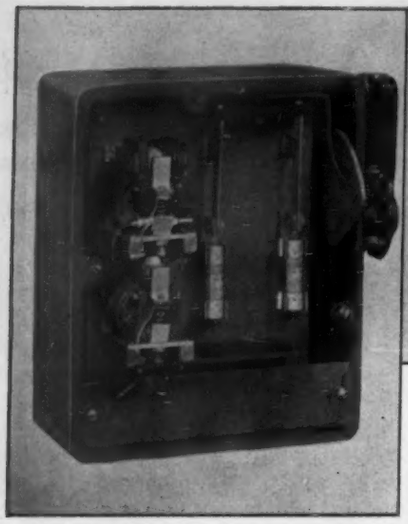


FIG 10.—STARTING PANEL IN CASE

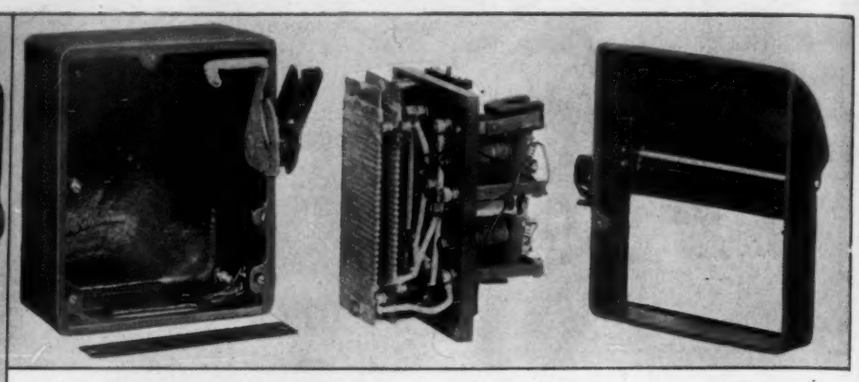


FIG. 11—DIRECT-CURRENT STARTING PANEL AND HOUSING, SHOWING STARTING RESISTANCE

a waterproofing process. Auxiliary contacts should have a positive action, to insure good contact and prevent accumulation of dirt. In many cases, where overtravel would be disastrous, as on planers and slotters, arrangements should be made to be sure the line contactors will open when the limit switch or master controller operates to cut off the supply of current.

Importance of Starting Resistance

In connection with starting apparatus, one of the most important items for consideration is the starting resistance. Except in the case of small motors, cast iron grids are very satisfactory for this service. Cast iron has a temperature coefficient of about 0.0007, and by adding a small per cent of certain alloys, a very high resistance grid is obtained which is suitable for rather small size of motors. For small motors, a high resistance wire, or ribbon, is suitable, which may be in the form of enclosed coils, flat plates or other special forms. A motor driving a load which is subject to infrequent overloads of short duration should have a resistance unit of large thermal capacity, while a motor subject to frequent overloads should have a resistance unit of small thermal capacity, in order to give more rapid cooling. In all cases, the resistance units and their mounting should be of rugged construction, and should be properly supported, so as to be conveniently accessible. The starting resistance should be so laid out in the various steps as to give practically uniform acceleration peaks. In certain cases, as fans, where the load increases with the speed, it may be desirable to have the transition points, or valley currents, tapered, the low points being at the beginning. This method requires less starting steps, and reduces the peak demands from the line.

The National Electric Light Association has proposed the following requirements for direct-current motors, as to maximum starting current, for 230 volts, which is the average factory voltage:

3 h.p., and below....12 amperes per h.p.
Above 3 h.p. ..... 9 amperes per h.p.
No motor may be connected without a starting resistance where the starting current exceeds 30 amperes.

The accompanying table gives the number of steps of starting resistance which should be required for general service. Of course, there will be instances in which it will be desirable to depart from this schedule, to meet peculiar operating conditions.

With the foregoing general requirements for appliances, and with the following typical special examples described, universal agreement is scarcely anticipated. In fact, it is hoped that the criticisms which arise will be wholesome and that other suggestions will be numerous with the result that the task of formulating specifications for standard electrical equipments for machines of the various services may be undertaken. The importance of standardizing cannot be too strongly emphasized. By this it is not meant that the detail appliances should all be of the same design—the various electrical manufacturers can work that part out for themselves—but that the control equipment for a certain type of machine should contain a uniform set of appliances. The space required by every electrical manufacturer would thus be practically the same, and the machine could be so designed as to accommodate the electrical equipment, with the result that the complete installation would be much neater in appearance and more satisfactory in every way.

At the present time, the problem of purely automatic control for general lathes has not been entirely solved. For many uses, the drum controller has been found to fill the requirements quite satisfactorily. An automatic starting panel, with a drum switch for reversing, has given good results for certain applications. Lathes for a special class of work have been controlled with safety and efficiency, so that it is believed that the day is not far distant when the goal for general lathes will have been reached. The functions of a car wheel lathe require that its electrical equipment be designed for especially heavy service, and that the control be reliable and as simple as possible. The equipment should consist of the panel and resistances, a push button station with "start", "stop" and "slow down", and a pendant or foot switch for "slow down", this latter feature being necessary when a hard spot is

Number of Steps of Starting Resistance

No. of Steps	Horse Power of Motor	
	Constant Speed	Adjustable Speed With full field starting
Directly on Line	Below 1 H. P.	Below 1 H. P.
1	1-3	1-10
2	3-10	10-25
3	10-35	25-50
4	35-75	50-75
5	75-150	75-150
6	150-200	150-200

reached in the cut, giving approximately 50 per cent of the basic speed at 100 per cent load. After the "slow" button is pressed, it should always be necessary for the motor to come to approximately full field speed before it becomes possible for the slow down contactors to be closed again, to limit the "pump back".

The panel requirements should consist of one line contactor, the necessary accelerating contactors, two dynamic brake contactors, one field accelerating relay, and a double pole, double throw line switch for reversing. The starting, brake and slow down resistance should be mounted on the back of the panel, when the size will permit, the field rheostat being mounted separately. The enclosing case should be of sheet steel for either wall or floor mounting. A panel for a 50-horsepower installation is shown in Fig. 2.

The control equipment for a boring mill presents many interesting problems. Where the mill is operating upon heavy castings, it should be accelerated slowly on starting. Dynamic braking should always be supplied when stopping to insure efficient stops, also to prevent damage to the motor by improper manipulation of the starter. The control scheme must be such that no possible combination of operating buttons will permit the motor either to run on the starting resistance when the load is decreased, or to produce a "pump back", with its consequent heavy sparking at the motor when stopping.

The type of control panel necessary to give most ideal operation on a boring mill, consists of a straight series-type current limit starter, with provision for maintaining a full field on the motor, until the last point of armature acceleration is reached. A field accelerating relay should be used when an adjustable speed is desired. Dynamic braking should be supplied in all cases, the resistance being adjusted for a full load current at high speed. The panel should be controlled by a "start" and "stop" push button. On very large machines a pendant switch is also desirable for use when setting up the work. An 18-foot boring mill in operation is shown in Fig. 3.

The applications of electric motors and their control to planers, slotters, and the like, is probably the most interesting, from an engineering point of view, as well as from that of economy in production, of all machine tool applications. The relative advantages and economies of the reversing motor drive for this purpose are now fully realized, and have been set forth in bulletins issued by the various electrical manufacturers. They are also thoroughly appreciated by all machine tool men, so that a summation of them will be unnecessary. However, the main electrical points to be kept in mind are sparkless commutation of the motor, stability of the motor at all speeds, gradual dynamic braking (to prevent undue shock on the machine) in the shortest possible time, quick reversing, independent cutting and return speeds, with a maximum range of 4 to 1, provision for a minimum drift when the motor is stopped or reversed, also when the power fails as a result of overload or low voltage on the line, reduction to a minimum of auxiliary contacts on the contactors, provision for position operation of the main contacts, "time efficiency" for the complete cycle and freedom from any undue influence from a reasonable amount of vibration.

Fig. 4 shows a 72-inch planer that was changed from a belt drive to electric drive, and the discarded material is shown in Fig. 5. Figs. 1 and 8 show a complete machine. Fig. 7 shows the results that may be obtained from a machine operated by this type of equipment. Fig. 14 shows a diagram of connections of a planer control equipment. Contactor No. 6 is the accelerating contactor. Contactor No. 8 is a second point dynamic brake, operated by the field current. When contactor No. 6 is open, the field current is completed through an auxiliary contact which short circuits the field rheostats as well as half of the coil on No. 8 contactor. When field current approaches its full field value, No. 8 contactor is so adjusted as to close. At full field on the motor, which is the slowest speed, No. 8 contactor will close almost instantly, while on weak field at high speed the contactor does not operate until such time as the field current has reached a predetermined value. This gives a definite time lag between closing of the first and second point dynamic brake contactor, which permits the motor field to be strengthened before increasing the dynamic brake load. When the motor is accelerating the contactor, No. 6 closes, thus opening the auxiliary contact and allowing the field current to pass through the field rheostats and both sections of the coil on contactor No. 8. The two sections of this coil are wound in opposite directions, and the field current passing through both sections de-energizes the contactor so that it opens. For emergency stopping, when the circuit breaker opens, an auxiliary contact on the circuit breaker connects the motor field to the armature, the armature being connected across the resistance for dynamic braking. To meet conditions of load where the full load cut is necessary up to the end of the stroke, a definite brake value on cutting speed is maintained, independent of return speed. This is accomplished by contactor No. 7, which has two half coils, one being connected across the line and one across the armature, either coil being powerful enough

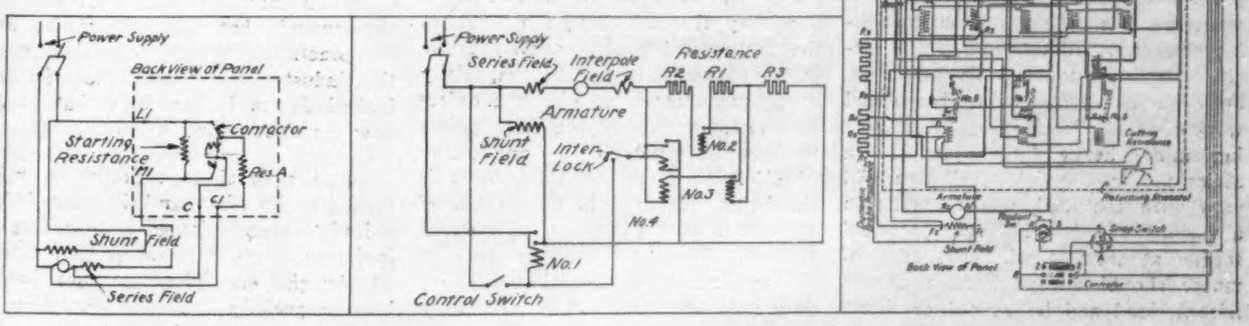


FIG. 12—CONNECTIONS OF AUTOMATIC STARTER WITH LINE SWITCH IN MOTOR CIRCUIT. FIG. 13—CONNECTIONS OF SERIES TYPE STARTER. FIG. 14—CONNECTIONS FOR PLANER CONTROL CONTACTOR PANELS, 10 TO 25 HORSEPOWER

to operate the contactor. When the motor is running in the cutting direction, the coil across the line is in the same direction as the coil across the armature, so that the contactor operates and short circuits a part of the dynamic brake resistance, which can be adjusted to give a definite dynamic brake value on the cutting stroke. When the motor is running in the return direction, the coil across the armature is opposed to the coil across the line, and the contactor is inoperative until such time as the armature voltage has dropped to a predetermined value and the armature has decelerated to a definite speed on dynamic braking; the coil across the line then overpowers the coil across the armature and the contactor closes, giving a third point dynamic braking on return stroke. With the above arrangement, the maximum variation of cutting stroke between no load and full load at high speed is about 1 inch and is practically zero at the slow speed.

The complete electrical equipment for planer drive consists of a reversing adjustable speed motor; a contactor panel and enclosing case with the field rheostats mounted inside of the cover, with external operating handles; the starting and dynamic brake resistance; a master controller of the drum type; a pendant switch for emergency operation, a snap switch and a special circuit breaker. A drum controller is used for controlling the cross rail motor. It is proposed to make the control equipment of the smaller horsepower sizes self contained to economize space and reduce the external wiring to be supplied by the user. An average time efficiency of 90 per cent, depending upon the speeds and cuts employed, is obtained with these equipments.

Not the least important factor for a successfully operating electrically controlled machine is the motor. In a shunt motor which starts under constant field excitation, the torque is directly proportional to the armature current. This type of motor is applicable for machinery where a constant speed is desired, as small printing presses, ventilating fans, small machine tools, woodworking machines, and the like. For adjustable speed work it is applicable to planers, boring mills, heavy lathes, etc. In a series motor, the field excitation will vary with the load, which results in a varying speed and a very powerful torque at slow speed. This type of motor should always have a certain friction load and be geared or direct connected to the load in order to avoid the possibility of the latter being thrown off and the motor accelerating to a dangerous speed. The type is applicable to centrifugal pumps, cranes and hoists. In a compound motor, the combination of the shunt and series fields produces the heavy starting torque with small variation in speed. The working speed can also be increased by means of the shunt field. This type of motor is applicable to machinery requiring large overload capacity for short periods of time, as rock crushers, air compressors, shears, large printing presses, etc.

While the control apparatus for general use must be designed to operate with a standard motor, it is necessary that the designers of both the motor and control appliances be in thorough co-operation, especially if the customer is to obtain satisfactory results. One of the main points to bear in mind in the application of electric control to shop tools is simplicity, not only in the design of appliances, but in the control schemes as well. This is especially true in the application to special and heavy duty machines, and will mean that in many instances the motor will require to be designed for its purpose and have the desired characteristics as to stability, overload, commutation, and the like. The control problem will then be very much simplified. Indeed, many of the troubles and probable failures of electric control in the past may have been due to the complicated control applied in an attempt to have the motor perform functions of which its design would not permit.

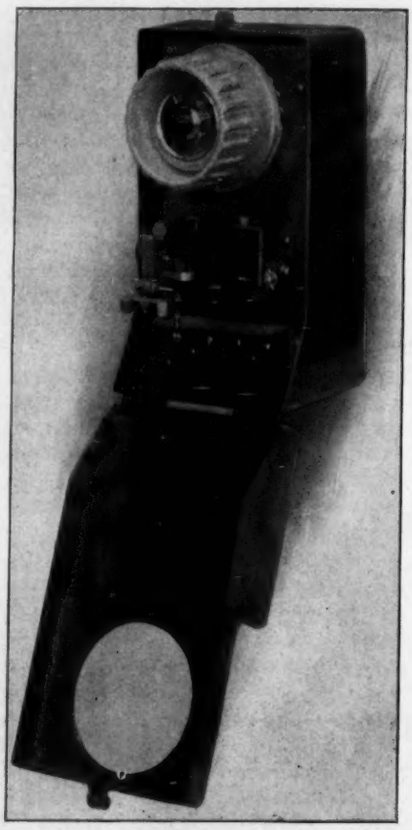


FIG. 15—STARTING PANEL FOR SMALL ADJUSTABLE-SPEED MOTOR, WHEN STARTING RESISTANCE IS NOT NECESSARY

Promoting Efficiency

There are two ways of promoting general efficiency—that is, of developing intelligent "team work", it is stated in a recent issue of the *Valve World*. One is through a centralizing of authority and direction in which the units act as parts of a carefully devised machine. The other is through friendly co-operation and interest in which the units maintain their independence and initiative. We believe the latter to be the only way by which collective efficiency can be developed and maintained in this country. To make the efficiency of individuals effective in the mass we must turn to co-operation not only among employes but between employes and employers. The employer does not do his whole duty in encouraging efficiency when he pays his employes good wages for their effective labor. He must show his employes unmistakably that he is distinctly friendly toward them, that he is personally interested in their welfare, that at no point may a line be drawn between him and those who work for and with him. The wise employer will take his employes rather freely into his confidence. He will make them feel that they are an integral part of his business and an indispensable factor in his success. The employes will not be treated as "hired men' but as co-workers with the employer in friendly combination for the success and prestige of the business. Efficiency without this friendliness, this warm personal interest between employer and employes, always will be an uncertain quantity; while efficiency coupled with hearty and frank co-operation cannot fail to meet any of the demands that new trade conditions are practically certain to make upon the industry and commerce of the United States in the days that even now are close upon us.

Large squirrel cage induction motors are described and illustrated in a leaflet recently issued by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These motors have been especially designed for heavy duty, constant speed, continuous service. The construction is shown in some detail in the booklet.

Character of High Speed Tool Steel

A KNOWLEDGE of the analysis and character of high speed tool steel is important to the engineer or works manager. This discussion of the performance of these steels under various forms of heat and mechanical treatment will be interesting because of its clear presentation of an unusually complicated subject

BY F. C. A. H. LANTSBERRY

HIGH SPEED steel is a material which may be very complicated in composition. It may contain as essential constituents iron, carbon, silicon, manganese, tungsten, chromium, vanadium, molybdenum and cobalt, many of the ultra steels containing as many as eight of these elements. The range of composition of the English high speed steels is: Carbon, 0.45 to 0.85; silicon, trace to 0.2; manganese, 0.1 to 0.5; tungsten, 8.0 to 18.0; chromium, 2.5 to 6.5; molybdenum, 0.0 to 2.0; vanadium, 0.0 to 1.5; and cobalt, 0.0 to 5.0 per cent. It now becomes clear why so little is known about high speed steel in spite of the enormous amount of work which has been done in the subject. With eight variables it is possible to get a very large number of combinations, and judging from the large number of high speed steels on the market, it would appear that the steel makers have exercised all their ingenuity in this respect. During the last five or six years the writer has inspected more than 40 different brands. Analyses of three of the most satisfactory of these ultra steels on the market at the present time are as follows:

	Steel No. 1, Per cent.	Steel No. 2, Per cent.	Steel No. 3, Per cent.
Carbon	0.60	0.64	0.63
Silicon	0.30	....	....
Manganese	0.04	0.16	....
Tungsten	14.62	17.77	14.76
Chromium	3.58	2.51	4.27
Vanadium	1.04	0.95	1.00
Molybdenum	0.54	none	1.22

The existence of so many varieties of high speed steels makes the task of the engineer or the works manager who has their selection a very difficult and thankless one. After 14 years of experience Taylor came to the conclusion that a tool should be ruined before any indication of its true value could be obtained. The writer's experience confirms that of Taylor, that the only real guide to the efficiency of any class of cutting tool is to test it to destruction. On account of the stiffer nature of the material, it is necessary to forge high speed steels at a temperature much higher than that generally adopted for ordinary carbon tool steels. Forgings should not be carried below 1,000 degrees Cent., otherwise the development of incipient cracks is very likely to occur, and although these cracks may not be visible, they are sure to cause trouble in the subsequent hardening process.

Annealing can be effected by prolonged exposure to temperatures not exceeding 800 degrees Cent., and in the hands of the user of high speed steel this treatment is much more satisfactory than the one adopted by the manufacturer who anneals the steel by prolonged exposure to temperatures in some cases above 1,000 degrees Cent.

Heating to Red-Hardness

It is necessary to heat high speed steel to temperatures verging on the melting point of the steel in order to develop the quality which has been called red-hardness. This heating can be carried out in any of the ordinary coke, gas or oil-fired furnaces which are used for the heating of steel. The temperature of the furnace should be controlled by means of a pyrometer, for it is by no means true that high speed steel cannot suffer by being overheated. The author is of the opinion that a temperature between 1,200 degrees Cent. and 1,250 degrees Cent. is the best for hardening high speed steel. Many writers state that a temperature of 1,300 degrees Cent. is necessary to properly harden high speed steel, but in this connection it is necessary to point out that the measurement of temperatures above 1,000 degrees Cent. is a very difficult matter in a laboratory, and becomes still more difficult when the operation has to be carried out under working conditions. Still, this does not detract from the use of a pyrometer in controlling operations so as to insure their always being carried out under uniform conditions. In the writer's opinion, however, it is to this difficulty in accurately measuring very high temperatures that the variation in the hardening temperature of high speed steel, as stated by different writers, is due.

Salt baths form a very convenient medium for the hardening and tempering of high speed steels. For hardening, the salt used is barium chloride, and this is best heated by means of an alternating current of low voltage. Such electrically-heated salt baths offer the advantage of great uniformity of temperature which can be easily controlled, and for small articles give excellent results. Larger tools are, however, liable to crack, owing to the rapidity of heating and require to be pre-heated at a temperature of about 800 degrees Cent. before immersion in the salt bath. On large articles these salt baths have a most peculiar effect. There is a tendency for the tools hardened in this way to have a soft skin, owing to decarbonization. In tools which have to be ground this does not affect the finished tool, but in form cutters the defect is so serious as to render this method of hardening untenable.

For a long time the author was inclined to think that the trouble was brought about by the adherence of a thin layer of air to the tool, which oxidized away the carbon during the heating, which is somewhat prolonged in the case of large tools. An endeavor was made to remove the difficulty by first immersing the tool in a bath of low melting salt, in order to thoroughly wet it before subjecting it to the high temperature. Although this improved matters it did not entirely remove the difficulty. Recent work by continental investigators appears to indicate that the carbon removal is due to combination with free chlorine which is formed in the bath. It is true that on prolonged use the bath does become alkaline owing to the formation of barium oxide, but free chlorine is never detected in the vapors evolved from the surface of the bath. The writer has always attributed this formation of barium oxide to the action of moisture at high temperatures, for it is certain that the vapors do contain considerable quantities of hydrochloric acid.

The tempering of high speed steels is effected at all temperatures between 0 degrees Cent. and 700 degrees Cent., according to the composition of the steel and the use for which the tool is intended. For temperatures up to 300 degrees Cent. oil baths are used, but above this temperature the use

From a paper read at a recent meeting of the West of Scotland Iron and Steel Institute.

of oil is attended with considerable danger. Above 300 degrees Cent. lead baths may be used, but the author prefers to use baths of fused salts. Up to 550 degrees Cent. the eutectic mixture of potassium and sodium nitrates can be used, and for temperatures in the neighborhood of 600 degrees Cent. to 700 degrees Cent. a mixture of sodium, calcium and potassium chlorides, melting at 500 degrees Cent., can be applied.

In view of recent discussions on the cause of the hardness of plain carbon steels after suitable treatment, it would appear to be somewhat premature to think about a theory for the hardness of high speed steel which, in addition to being such a complex body, offers the further complication of possessing two kinds of hardness. Still, since no one has yet produced a steel tool containing no carbon, it must be presumed that this element is the chief cause of the cutting properties of steels. Therefore, any theory for the cause of the hardness of high speed steels must be based on the hypothesis for the cause of the hardness of carbon steels.

Chromium Raises Temperature

The earliest theory of high speed steel was one enunciated by Bohler in 1903. His idea was that the tungsten and chromium together lower the pearlite change to a temperature below atmospheric, so that at the ordinary temperature the stable state of high speed steels was the hard state. It has since been proved by many workers that instead of lowering the critical temperature at which the carbon is thrown out of solution, chromium actually raises the temperature, with the result that chromium should tend to make it more difficult to keep the carbon in the hardening form. The elevation of the change point is considerable, being about 10 degrees Cent. for each 1 per cent of chromium added. Another point of importance is that the critical point is to all intents and purposes independent of the temperature from which the alloy has been cooled. The effect of chromium, therefore, must lie in the direction of double carbides, the existence of which in annealed steels has been proved by the work of Prof. Arnold. Unfortunately, his work in this field was not extended to hardened steels.

With regard to the effect of tungsten on the transformation points of pure iron-tungsten alloys, it has been shown that the temperature of the conversion of alpha into beta iron and vice versa was not affected by the presence of tungsten. The temperature of the beta-gamma change, however, was increased, a 5 per cent addition of tungsten raising the upper transformation point by 30 degrees Cent. At the same time, however, the intensity of the reaction diminishes, showing that the amount of gamma iron converted into beta diminishes as the content of tungsten increases. Since the intensity of the beta-alpha change remains constant there must be a certain amount of beta iron produced by a decomposition of the iron-tungsten compound which is deposited from the melt.

Effect of Tungsten

Experiments on a series of steels containing about 3 per cent of tungsten and varying amounts of carbon showed that if the heating were not carried unduly high the cooling curves of these steels were not sensibly different from similar carbon steels containing no tungsten. If, however, a certain temperature be exceeded the resulting curve shows a marked lowering of the Ar, point from 68 degrees Cent. to 570 degrees Cent. The lowered temperature is constant, but the temperature to which the steel must be heated in order to bring about the lowering increases with the carbon content. Earlier researches had indicated that the critical points of tungsten and molybdenum steels were influenced by the temperature to which the steel had been heated before the cooling curves were taken, but his results appeared to indicate that the action was not a simple lowering of the critical temperature, but that the transformation was split up into two parts, one of which took place at a very low temperature.

Probably the most instructive results which have been obtained on the theory of high speed steels up to the present were those obtained by Edwards and published in the Carnegie Memoirs of the Iron and Steel Institute for 1908. This author worked on two series of steels, one containing a constant chromium content of about 6 per cent and a tungsten content which gradually increased from 0 to 19 per cent, while the other series contained a constant tungsten content of about 18 per cent and a chromium content which gradually increased from 0 to 8 per cent. His results show that so long as the initial heating temperature is not raised above 950 degrees Cent., the addition of tungsten has no influence on the position of the critical points. If, however, the alloys be initially heated to 1,320 degrees Cent., the subsequent cooling curves show that the critical point is split up into two parts, an upper and a lower part. The upper point is slightly raised while the lower point occurs at a temperature of between 420 degrees Cent. and 470 degrees Cent. That this action is directly due to the tungsten is shown by the fact that the cooling curve of the alloy containing no tungsten is not affected by the temperature of initial heating.

There can, therefore, be no doubt that whatever may be the cause of the particular properties of high speed steels, it is not the lowering of the critical points to below the ordinary temperature, because under normal conditions of heating and cooling chromium raises the Ar_1 point and tungsten does not affect it at all. Since tungsten steels only develop the low critical point when cooled from high temperatures, it would appear that this point is independent of the true Ar_1 point, and is brought about by a carbide of tungsten which is only produced at high temperatures. It may, however, be due to the formation of a tungstide of iron since the probability of the existence of such a compound has already been experimentally foreshadowed. In a tungsten-chromium steel, however, this lower point is found to disappear when the chromium exceeds a certain amount and the alloy is cooled from a very high temperature. It would appear, therefore, that in the high speed steel the effect of heating to temperatures in the neighborhood of 1,250 degrees Cent. is to produce a double carbide of tungsten and chromium in the form of a solid solution in gamma iron. The presence of the chromium raises the temperature at which the carbide is thrown out of solution, rendering it possible to work at a much higher temperature in cutting, and at the same time the double carbide is a much more stable body than carbide of iron.

Question of Effectiveness of Methods

In his book on the art of cutting metals, Taylor says that the two methods yet devised by scientists for determining the most important quality in the new high speed steels are ineffective, but the writer disagrees with this conclusion, and at the present time has an elaborate research in progress with the object of throwing more light on this complicated branch of metallurgy. It is expected that the application of the examination of residues will throw considerable light on the nature of the double and possible treble carbides which undoubtedly exist and play an important part in the properties of high speed steels. Until the knowledge of

this phase of the subject is supplemented by the facts of more extended experiments than have yet been conducted, definite conclusions can have but little weight.

The study of the microstructures of high speed steels is a most fascinating one, and it is now proposed to deal with this subject here as briefly as possible. A specimen was cut from a very large bar of high speed steel intended for the manufacture of cutters of large diameter. Considerable trouble was experienced with the cutters when made, and investigation indicated that the structure was the typical cast structure of high speed steel. The amount of heating and mechanical work resorted to in the rolling of the bar from the ingot had not been sufficient to confer the typical fine structure to the steel. A peculiar feature in this case was that the structure persisted after hardening, although it took a somewhat longer time to develop on etching. It was found that the only methods of obliterating this structure were either by forging or by a prolonged heating at temperatures above 1,000 degrees Cent. Herein lies the explanation why it is advisable that the annealing carried out by the steel maker should be effected at high temperatures. It is because of the fact that in these high speed steels the diffusion of the various constituents into each other is very slow, with the result that the large casting structure can only be effectively removed by some very drastic treatment.

Overheating Tool Steel

It has been declared impossible to overheat high speed steels, but many of us who have had to deal with high speed steels in large masses have found that this statement is an erroneous one. A piece of high speed steel which the writer considered as correctly hardened was heated to a temperature of 1,220 degrees Cent. for a period of two minutes and then quenched in whale oil. The structure was a fine austenitic one, but there were specks of an apparently different constituent from the ground mass scattered over the surface. Another piece was heated for five minutes at the same temperature, with the result that the grain became considerably coarser. A piece of steel of the same composition was heated for two minutes to a temperature of 1,290 degrees Cent. Such treatment, at a temperature only 70 degrees Cent. higher than the last, produced an entirely different structure. The grains had become very coarse, and called to mind the cored structure of solid solutions. At the same time a new intergranular constituent had made its appearance.

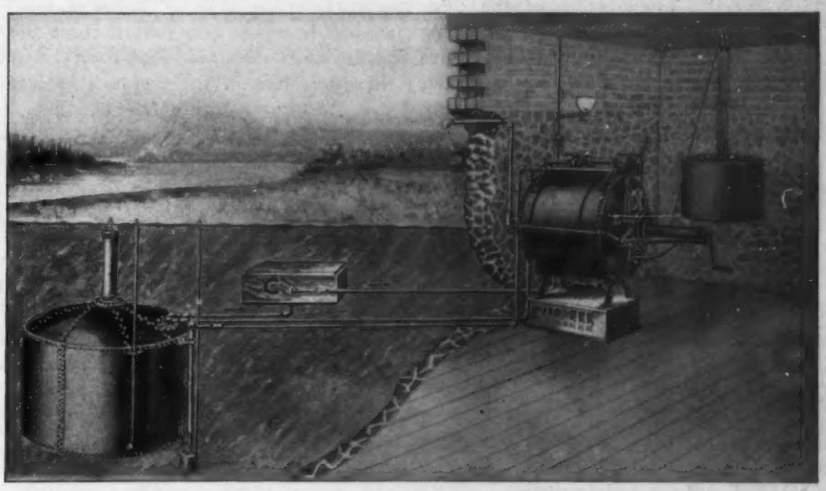
The breakdown of high speed tools in use has been attributed not to the loss of red-hardness, but to the appearance of a new constituent which is brittle. The writer has examined many samples of steels tempered at all temperatures on the scale, but has never found the brittle constituent.

No change in the structure of high speed steel apparently is effected by tempering below 450 degrees Cent. It has been claimed that no change is effected below 550 degrees Cent., but the author has found that the point at which tempering begins is largely affected by the temperature at which hardening was carried out. In any case, however, tempering certainly begins at some temperature between 450 degrees Cent. and 500 degrees Cent. In the microstructure, tempering is first made apparent by a darkening of the surface after etching. In a steel tempered at 490 degrees Cent., the outlines of the grains could still be faintly discerned, but as the tempering was continued to 680 degrees Cent. the outlines disappeared and white specks made their appearance. Large numbers of these were visible on a specimen tempered at 750 degrees Cent. The effects of maltreating high speed steel can only be removed by prolonged annealing, because of the diffusion of the complicated carbides formed at high temperatures being extremely slow.

The Bridgeport Forge & Projectile Co. and the Bridgeport Projectile Co., each has filed a notice with the state of Connecticut for an increase of stock. The former company is to add $5,000,000 and the latter $2,000,000 to their capitalizations.

Gas Generating Machine

A simple, effective and economical gas-producing machine which has been widely adopted by steel makers and others for laboratory use as well as for general heating and lighting, has been developed by the Tirrill Gas Machine Lighting Co., 103 Park avenue, New York City. Safety considerations have been given due weight in designing this outfit. The generator, containing the carburetor, is buried in the ground, 30 feet from the building and requires no vault or special structure to house it. The mixer, which is connected with the generator, also is buried in the ground. Gasoline vapor from the generator and air from a meter, or air pump, located at some convenient point, are fed to the mixer in regular proportions. The meter is operated by weight or by a water wheel in some cases. It may be located adjoining a furnace or examined with a flame and is made in capacities ranging from 15 to 1,000 lights. The Tirrill company also manufactures a patent air-mixer which may be attached to burners for the purpose of insuring economical gas consumption.



TIRRILL GAS GENERATING MACHINE

The Cutler-Hammer Mfg. Co., Milwaukee, has issued a large four-page folder, printed in two colors, dealing with the increase in the lifting capacity of the latest types of Cutler-Hammer magnets. It is stated that with these new magnets more material can be handled with fewer magnets, making fewer trips for the crane and therefore reducing the time involved in any given handling operation. The same folder contains illustrations of the Cutler-Hammer magnetic lockout switch and also illustrations of motor-controller installations in a number of plants.

An Improved Hack Sawing Machine

A HACK saw machine with improved features has been placed on the market by the Peerless Machine Co., Racine, Wis. It is provided with an automatic feed and saw lift and with a vise equipped with a quick-acting device. Special attachments are provided for handling short pieces and clamping irregular sections. The design of the saw-blade holder and tightener has been improved. Although the construction of the machine is heavy, it is said to be capable of handling sensitive work.

The base of the machine is of the full cabinet type which, it is emphasized, eliminates the chance of springing the working parts of the machine when heavy work is being cut, or of vibration occurring when operating at high speed. The bottom of the cabinet forms the cutting compound tank, with the circulating pump in the interior of the cabinet at the back, out of the way of injury.

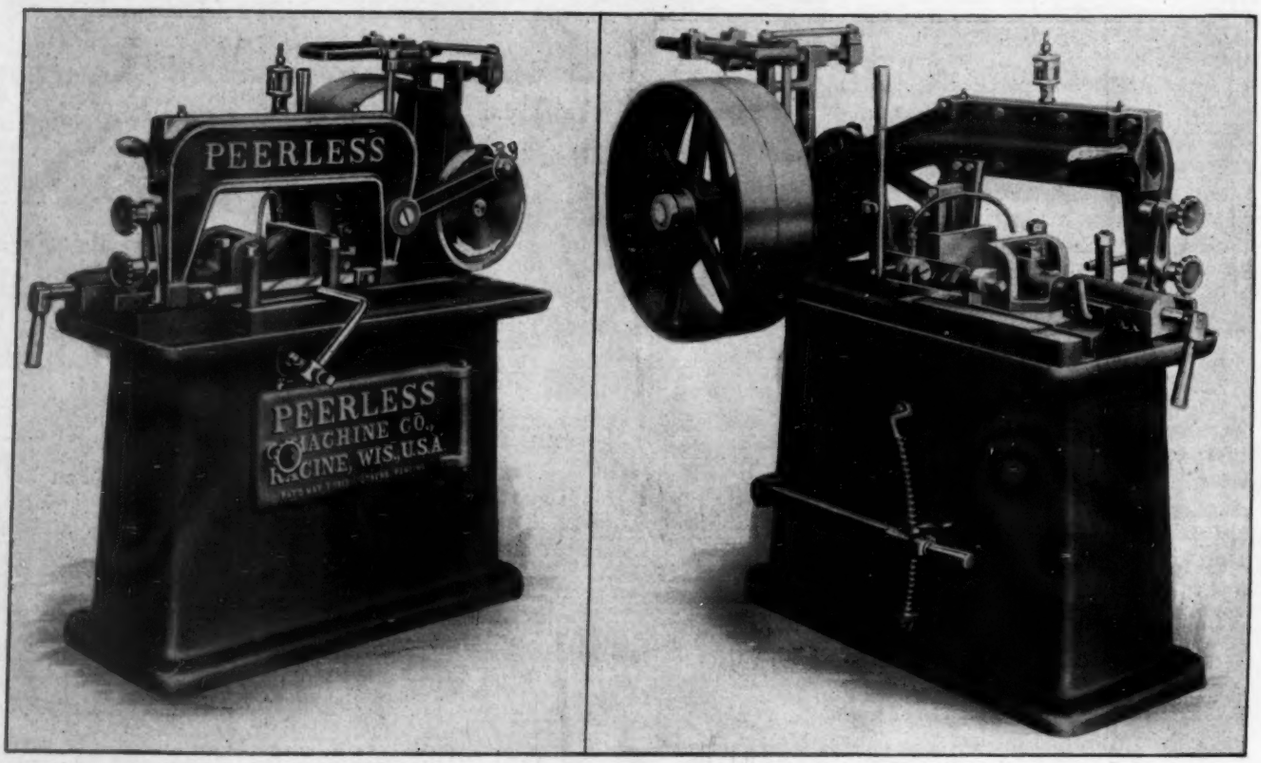
The saw table is provided with T-slots on each side of the vise for clamping work of irregular section that cannot be readily held in the vise. The vise is of the quick-acting type with an attachment for short pieces. A screw adjustment of 1 inch is provided to aid in clamping the stock.

The saw frame travels in a V-shaped slide and the bearing on it is 11½ inches in length, which is relied upon to insure a long life. It is pointed out that only one adjustment is necessary for taking up wear, this being the upper slide. The saw blade travels in the center line of the guide and connecting rod, an arrangement designed to eliminate side pull.

The feeding mechanism has a spring that gives the same effect as if a weight were used. The uniform pressure is controlled by a lever passing over a notched segment on the base, shown at the left in the accompanying illustrations. The pressure depends upon the position of the lever between the bottom and the top notches. The belt shifting lever controls this mechanism, the machine commencing to operate as soon as the belt starts to shift. The feed mechanism, however, does not come into action until the belt has been shifted three-quarters of the distance between the loose and tight pulleys, this arrangement being relied upon to allow the cutting compound to be supplied to the blade and work before the feed is engaged. Another advantage claimed for this arrangement is that the operator can apply a little pressure on the blade by pressing down on the handle shown on the saw guide until the machine has made a few strokes, this feature being particularly useful in starting a square corner with a coarse toothed blade and a heavy feed pressure. If desired, the feed can be entirely released by placing the lever at the lowest point of the notched segment. The sensitiveness of the feed is such that it is said the blade can be made to just scratch the work.

A spring is employed for the automatic lifting mechanism. A cam on the main shaft is relied upon to permit the feeding spring to act only on the cutting stroke, and when this is completed the cam automatically disengages the feed, the saw frame rising and bringing the blade clear of the cut due to the overbalancing action. At the end of the return stroke, the feeding spring is again brought into action, the process being repeated until the cut is entirely completed, when the power is automatically shut off. The control of the feeding mechanism by the belt shifting lever, it is pointed out, causes the feed to be released before the machine stops, the saw frame rising automatically.

A length gage is provided for the saw frame for use where a considerable amount of stock of the same size is being cut. A depth gage stops the machine automatically at any desired depth of cut and raises the frame clear of the work. This arrangement serves to save time and to relieve the op-



FRONT AND REAR VIEW OF HACK SAW MACHINE

erator of the necessity of lifting the saw frame after each cut.

In tests made of this machine, it is claimed a 3-inch bar has been cut off in less than two minutes with an operating speed of 250 revolutions per minute and a 1-inch round cold rolled steel bar has been cut in less than one minute at a speed of 125 revolutions per minute, with an ordinary hand hack saw blade. In another test the end has been cut off of a piece of 1/16-inch steel sheet set edgewise in the vise.

Lichtenstetter & Sherman have established general engineering offices at 423 James building, Chattanooga, Tenn., specializing on structural steel and plate work. Lichtenstetter & Sherman also are southern agents for several companies making ornamental iron, fireproofing materials, special materials, special machinery, industrial cars, etc.

Guard for Grinder

A new design of guard for grinding machines has been brought out recently by the Ransom Mfg. Co., Oshkosh, Wis. These guards are suitable for 16, 18, 20 and 24-inch diameter wheels. The general features of the guard are shown in the accompanying illustration, which also illustrates one of the companys grinding machines.

GUARD FOR GRINDING WHEEL

The guard is boiler plate, with the exception of the adjustable trap at the top end, the nut guard and the exhaust pipe connection. The adjustable trap is a steel casting securely held by screws. The nut cover is cast iron. The outer plate is hinged and may be opened to allow changing of wheels or cleaning out the guards. The guard has a box formation at the bottom where all iron, steel and heavy particles from the abrasive wheel are caught. The lighter particles are removed by a suitable exhaust-pipe connection at the back. This arrangement, it is claimed, reduces the liability of exhaust pipes becoming clogged.

Sparks from the Grinding Wheel

By H. O. Tair

SALT LAKE CITY, advocating intensive preparedness, offers a site for a national naval academy, arguing that a week's cruise on its highly saline waters would be as effective as a year on such a diluted proposition as the ocean. By this token, Cleveland, with its annual invasion of nine billion Canadian soldiers, would make a great place for a second West Point.

* * *

The Russians are in the market for 2,000,000 scythes. Sounds like the Kansas version of preparedness.

* * *

Some smug senatorial Sadducees who roared when the U. S. failed to protest Belgium's invasion, are strong for Ben Tillman's plan to garrote private armor manufacturing enterprise.

* * *

A recent gas shortage threw 30,000 people out of work in West Virginia; this seems an economic irony, with the house and senate only a few miles away.

* * *

Iron ore will never be exhausted, say experts. Alas, steel will keep on getting fatigued.

* * *

Statistics show that accidents are more than twice as frequent among steel plant employes who can't speak English, as among those who can. Those who have heard a conversation in the Slav tongue can well believe that most of the accidents are compound fractures of the lower maxillary, and that many of them are not reported.

* * *

Henry Ford is dead set agin preparedness. And so poor tin lizzie has to go without shock absorbers and a self-starter.

Not long ago our executive was too proud to fight. Now, it appears, he is only too proud to fight.

* * *

Henry Ford (may his worries decrease),
Awoke one night from a deep dream of peace;
And lo—now, reader, don't get sore—
Hank just rolled over and dreamed some more.

* * *

"Carnegie Steel Co. raised shapes $2.95 and plates $3.50 a pound at warehouse," announced the *Pittsburgh Post*, Feb. 23. This places shapes at $5,900 and plates at $7,000 a ton. Josephus Daniels hasn't said a word.—*H. C. E.*

* * *

Order for Schrapnel. — The ——— Iron Co. recently received an inquiry to quote prices on two hundred tons of schrapnel shell, to be shipped direct to Europe for one of the belligerent nations. The manager notified the concern inquiring, that the local foundry could not handle any part of the schrapnel contract. The ——— Iron Co. is engaged in the more peaceful pursuit of furnishing steel girders, stairways and other heavy material for some of Northwest Missouri's biggest business buildings. — Chillicothe, Mo., *Tribune*.

Could the spelling of "schrapnel" have any connection with the sentiment expressed?

* * *

Representative Hill says that proper encouragement of the aniline industry will insure a plentiful supply of high explosives in time of war. Dye-stuffs and die-stuffs, as it were.

* * *

Poincare has his Schneider-Creusot; William II has his Krupp; and Uncle Sam . . . may profit by their example!

A couple of aeroplane companies are planning a merger. In case new stock is issued, it is hoped that the blue-sky law need not be invoked.

* * *

Whilst we converse amiably about the coming American merchant marine and deplore the lack of building facilities, little Norway places orders for 28 ocean steamers in American ship yards.

* * *

A recent single article in *The Daily Iron Trade and Metal Market Report* employed the following:

homophonous asseverated
anomalous iatroleptic

In view of the fact that the story concerned war supplies, the reader is inclined to agree with Sherman.

* * *

Appropriations for anti-aircraft guns are called for at Washington. Maybe some of these noisy presidential bees are mistaken for battleplanes.

* * *

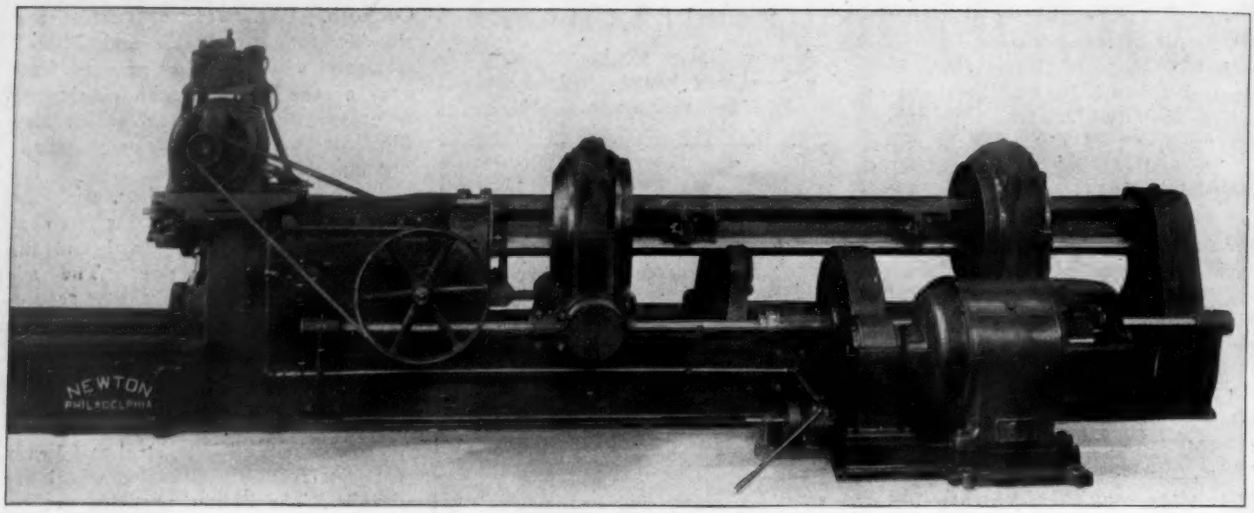
It is not improbable that microscopic analyses of armor steel made in that government plant of Ben's, will reveal rather less *austenite* and *pearlite*, than plain old *trichinae*.

* * *

An Alabama foundry advertises ornamental posts. Ought to dispose of a lot of 'em to the administration, for its friends, the office seekers.

* * *

A German family, says a contemporary, controls the world's supply of copper by playing American and other producers against one another. Which indicates also a corner in brass.



Machine for Boring and Finishing Torpedo Flasks

Machine Facilitates Torpedo Making

AN INTERESTING machine which is said to be capable of boring and finishing the inside of torpedo flasks or shells in an unusually short time has been perfected by the Newton Machine Tool Works, Inc., Philadelphia. As shown in the accompanying illustration, its principal parts include a main head on which a motor drive is mounted, and which also supports the stationary boring bar; the machine is fitted with two revolving chucks rotated in unison by a common shaft through worm wheels. The bed is unusually long in order to permit the main head to withdraw the boring bar from the work by means of a fast power traverse. The boring bar is equipped with tool heads on either side. These pass each other without interference. Each tool head is actuated by means of a power feed along the boring bar. Adjustment of the tool heads at right angles to the axis of the bar is controlled by means of formers which conform to the contour of the flask being bored. The jaws of the revolving chucks are specially designed to prevent the crushing of the flask. The machine weighs more than 35 tons and occupies a floor space 8 feet long and 40 inches wide.

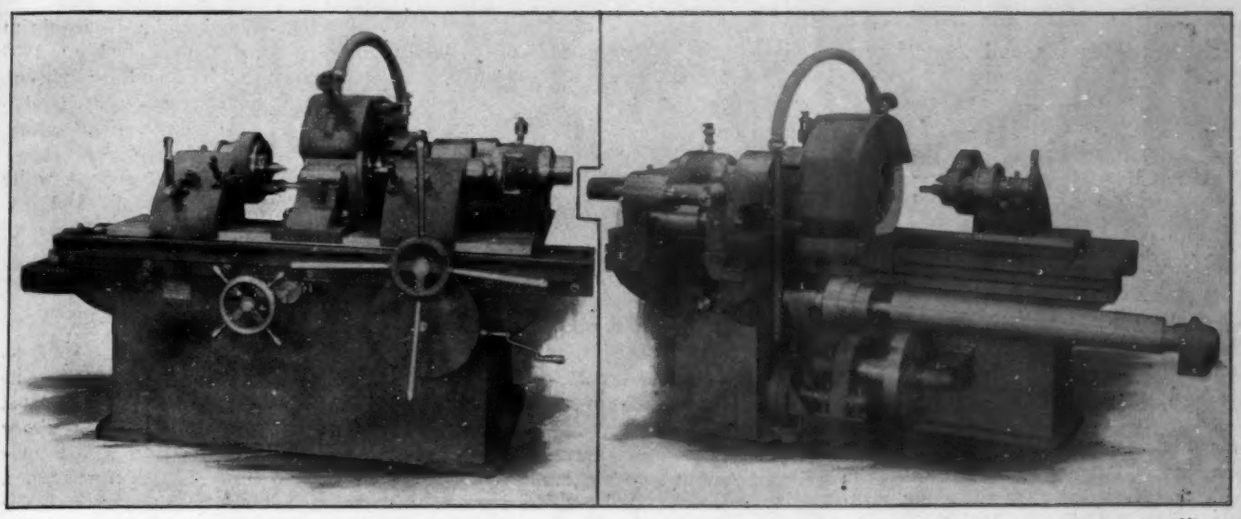
A group of New York engineers recently has formed a working agreement whereby it is believed better results can be obtained for their clients through the plan of co-operation outlined. A booklet entitled "Consultants" recently has been issued by them and outlines the plan in detail. The engineers and engineering firms that have entered into this agreement follow: E. D. Anderson, automatic machinery; W. H. Chappell, production contractor; Francis W. Collins, industrial and financial investigations; John F. Daniell, retail and department store economics; Albert A. Dowd, machine shop practice; C. E. Knoeppel & Co., organization and management; E. St. Elmo Lewis, sales and advertising and market investigations and F. M. Williams, industrial chemistry.

Describes Counters

The Durant Mfg. Co., Milwaukee, Wis., manufacturer of automatic counters, has issued a handsomely illustrated catalog devoted to the different models it has developed. These counters are called productimeters, and are the 1916 development of the original Durant flour packer tally invented in 1879. This original idea has been broadened until today this company's counters are used for recording production in hundreds of different industries. The name of the instrument was chosen because it emphasizes the importance of the figures which it furnishes. The instruments enable a manufacturer to keep an accurate count of his production. One of the company's models is shown as adapted to a stamping press. The counter automatically reverses to zero after running to capacity and then repeats, but it may be reset at any time. This model contains a special design of ratchet which is said to insure absolute accuracy at any speed up to 250 strokes per minute. These counters are inclosed in a compact case. Oiled bearings are provided for the heavy driving shaft and lugs permit the counter to be attached readily to either vertical or horizontal surfaces. A wide variety of these counters are illustrated and described in detail. They are said to be especially adapted for stamping presses, punch presses, screw machines and lathes. One model also is adapted for measuring rope and wire.

The Snyder Electric Furnace Co., 53 West Jackson boulevard, Chicago, announces that since the establishment of its foreign office a year ago at Old Bank Chambers, Bradford, Yorkshire, England, a number of contracts have been closed for electric steel furnaces, including a 3-ton furnace for the Daimler Co., Ltd., England, two 12-ton furnaces for Thwaites Bros., England; one 12-ton furnace for Summerson & Sons, Ltd., England, and a 6-ton furnace for the National Steel Foundry Co., Ltd., Scotland. The foregoing furnaces are rated on a 24-hour basis. In addition, four large furnaces for special smelting work have been contracted for, together with a small furnace for experimental work. The European agency of the Snyder Electric Furnace Co. is in charge of G. J. Stock.

The plant of the Cherry Tree Iron Works, near Johnstown, Pa., has been purchased by William Brown of Pittsburgh, and associates, who plan to install machinery for the manufacture of munitions. The company has a number of orders for mine cars.



Front and Rear Views of Grinder for Round Work

Grinder Designed for Cylindrical Work

A GRINDING machine designed especially for handling round work is shown in the accompanying illustrations. The emery wheel is 20 inches in diameter with an 8-inch face. When the surface to be ground is less than 8 inches long, the work is not traversed, making possible the grinding of formed parts. Longer work is traversed through a hand wheel operating a pinion, which drives a rack under the work table. The work is stopped or started through a hand lever on the front of the head stock, the lever operating a clutch on the back gear shaft. The grinding wheel has an 8-inch hole. The wheel is mounted on a heavy spindle which revolves in bearings designed to decrease wear and friction to a minimum.

This machine can be adapted for belt or motor drive, the motor being located behind the base. A pulley on one end of the motor drives the grinding wheel spindle directly through an endless belt. Automatic belt tighteners and idlers compensate for the wear of the grinding wheel. The pulley driving the back shaft, which in turn drives the drum shaft, is located on the opposite end of the motor shaft. This drum drives the work pulley in the head stock, three different speeds being obtained through cone pulleys. The grinding wheel is fed to and from the work through a pilot hand wheel on the front of the base. A stop provided with micrometer adjustments limits the forward movement of the wheel up to the work. The grinder occupies a floor space 61 x 38 inches. Its shipping weight is 5,500 pounds. The machine has been brought out recently by the Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.

Boiler Economy

"Finding and Stopping Waste in Modern Boiler Rooms" is the title of a 68-page bulletin attractively published in several colors by the Harrison Safety Boiler Works, Philadelphia. The operation of the company's metering heaters and independent meters, the latter including metering hot wells and meters used in connection with closed and open heaters and exhaust systems, are described. A considerable portion of the book is devoted to a discussion of the theory and practice of modern boiler room operation. A history of metering heater design is included. A new type of meter working on the volumetric principle, which is claimed to operate to within one-half of 1 per cent accuracy, is described.

The Commercial Welding Co., Newark, N. J., has recently been organized for welding new or repair parts by the arc, butt, spot and gas welding methods. J. W. Raynor is general manager of the company. A new type of welding equipment developed by this concern, comprises an arc welding dynamo driven by a gasoline engine mounted on a sub-base. This equipment is self-contained and portable. For marine, stationary and locomotive boiler work, an auto truck will be used to transport the company's welding equipment to the shops where the repairs are to be made. The company's equipment includes electric spot welding machines for handling sheets up to ½-inch in thickness, electric butt-welding machines capable of welding 2-inch bar stock, and oxy-acetylene equipment for welding and cutting.

Book Reviews

Industrial Uses of Fuel Oil, by F. B. Dunn; 235 pages; cloth; illustrated; published by Technical Publishing Co. and furnished by *The Iron Trade Review* for $3, net.

This volume is a practical exposition of the use of fuel oil for industrial purposes. A brief description of various processes precedes a detailed exposition of furnace and burner arrangement and approved methods of operation. It is intended that the work should serve the architect, engineer, fuel oil salesman and efficiency expert in determining the applicability of fuel oil to various purposes. It is written by a practical man for practical men. A chapter on tests and furnace efficiency is provided to aid the operating engineer in checking boiler losses and determining true efficiency. Numerous tables give data on the value of fuel oil as a heat producer, compared with coal, gas and other fuels. Diagrams illustrate satisfactory and safe methods of storing and pumping oil.

The use of oil as a fuel is discussed as applied to boiler heating; the clay, lime and cement industries; glass, sugar and rubber, smelting furnaces; metallurgical and shop furnaces; the steel industry; naval and maritime purposes, etc. Illustrations

are provided in profusion to make clear the appliances and installations described.

The Authentic History of the United States Steel Corporation, by Arundel Cotter; 231 pages, 5½ x 8½ inches; cloth; illustrated. Published by the Moody Magazine & Book Co., New York, and sold by *The Iron Trade Review* for $2 net.

Readers of *The Iron Trade Review* are familiar with much of the data out of which Mr. Cotter has wrought his readable and interesting story of the great Corporation, his book having largely been compiled from evidence submitted during the historic dissolution suit. Admittedly a sympathizer with the ideals which actuate the men responsible for the Steel Corporation's success, Mr. Cotter declares that "the principal events leading up to the incorporation of the mighty company, its objects and its policies and the results therefrom on labor, contain a considerable amount of human interest," adding that if he succeeds in bringing home to the steel stockholder "the man in the street", what the Corporation has stood for, and what it still stands for, he feels that his labor will not have been in vain.

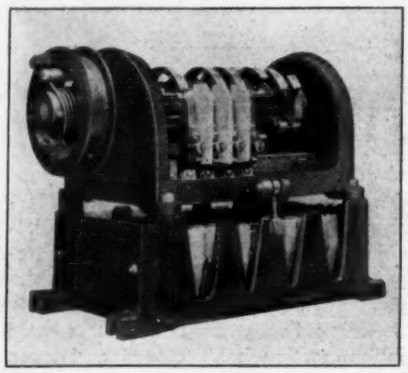
The book begins with a brief survey of conditions preceding the organization, including a dramatic account of the after-dinner speech, in which, it is said, Charles M. Schwab influenced J. Pierpont Morgan to undertake the formation of the merger. A somewhat Herstian revel in comparative figures to bring home the immensity of the Corporation's capital introduces the chapter dealing with its inception, which, however, is well described. Other chapters include early history, dealing with the bond conversion plan; the birth of the city of Gary, Ind., and the Hill ore lease. A chapter is inserted descriptive of the heroic work of Morgan in the panic of 1907 and of the conditions which culminated in the purchase of the Tennessee Coal, Iron & Railroad Co. Other chapters discuss the men of the Corporation, including interesting pen pictures of Gary, Morgan, Schwab, Perkins and others; the development of export trade; an interpretation of the spirit animating the organization as it appears to the author; the Corporation's implements, describing the tremendous equipment of mines, steamship lines, railroads, blast furnaces, coking plants, rolling mills and machine shops through which the work of the nation's greatest industry is carried on; and the steel towns, which interestingly sets forth the development of such communities as Gary and Fairfield, Ala.

Safety first, sanitation and welfare plans, with an account of the work now being carried on to better the living and working conditions for the Corporation's employes and their dependents; questions of policy, in which the author adopts a decidedly favorable stand towards his subject, including a most readable account of the Gary dinners; investigations and the dissolution suit; later history—1907 to 1915; and statistics, financial and otherwise, are also discussed.

Mr. Cotter has undoubtedly approached his subject with a fair and open mind; he has not hesitated to criticize the Corporation i several instances; and his conclusions so emphatically in its favor are apparently well-founded. History, at such a brief perspective, is the most difficult of sciences and the author has discharged his by no means easy task in a creditable manner.

New Crane and Hoist Controller

The accompanying illustration shows a new reversible drum type controller, with the enclosing cover



ROPE OPERATED CONTROLLER

removed, designed for overhead mounting with rope operation. These controllers, which represent a recent addition to the crane and hoist controller line of The Cutler-Hammer Mfg. Co., Milwaukee, are designed for installation indoors for intermittent speed regulating duty, such as in crane and hoist service. Two standard types are made, one giving 50 per cent speed reduction under half full-load current and the other giving 90 per cent reduction under light-load conditions. The first type giving the 50 per cent reduction is for general crane and hoist duty, while for foundries or wherever the average load must be handled by the crane at a steady, slow speed, the controllers providing for the greater speed reduction are preferred.

A pamphlet discussing the proper care of belts has been issued by the Joseph Dixon Crucible Co., Jersey City, N. J. The booklet is a reprint of one originally published in 1909 and has been revised and brought up to date. Some of the questions discussed are: Slipping, overloading, dirty, tight and slack belts. One section is devoted to belt dressings, while another gives "Hints, Kinks and Tables", which will prove of value to users of belts.

Installs Electric Drive

The Inland Steel Co., of Chicago, is making important extensions to its Indiana Harbor plant and, as reported in previous issues of *The Iron Trade Review,* the improvements will include several new open hearth furnaces, a blooming mill and finishing mills. The various mills will be electrically driven and a contract for the electrical apparatus has recently been let to the Westinghouse Electric & Mfg. Co., Pittsburgh. The apparatus called for in the contract includes two 5,000 kilowatt, 25-cycle, 2,400-volt turbo-generator units; two 1,000-kilowatt synchronous motor-generator sets; one 15,000-horsepower direct-current motor; two 8,000-horsepower motors and a large amount of auxiliary apparatus. The 15,000-horsepower motor will be direct connected to the reversing blooming mill and will receive its power from one of the motor-generator sets. The Inland Steel Co.'s plant also include a 32-inch reversing roughing mill and a 28-inch three-high finishing mill which will be driven by individual 8,000-horsepower motors. The auxliaries will be supplied from the two 1,000-kilowatt synchronous motor-generator sets.

In adopting motor drive for its new mills, the Inland Steel Co. is perpetuating a policy inaugurated about two years ago when several of its sheet mills were provided with motor drive. An illustrated article describing the Inland Steel Co.'s motor-driven sheet mills was published in *The Iron Trade Review* March 19, 1914.

The McCall & Clarke Co., 101 Park avenue, New York, have issued in booklet form the first five chapters of "The Practical Application of Efficiency Methods", by C. E. Knoeppel, originally published in *The Engineering Magazine.* These chapters appear under the title "The Case of the Enterprise Manufacturing Co."

Cornelius T. Meyers, chief engineer of the Timken-David Brown Co., delivered an address before the Engineering Society of Buffalo, N. Y., Feb. 16, on the subject of "Worm Gearing in Industrial Machine Work". The meeting was held at the Hotel Statler and was preceded by a dinner.

MALLEABLE IRON

Its Characteristics, Uses and Abuses

BY ENRIQUE TOUCEDA

AS A material of construction and as a component part of machines, the malleable iron casting has covered a wide field of usefulness, particularly during the past 40 years. The industry has had a rapid growth, and at the present time there are about 130 malleable foundries in this country, with an aggregate capacity of close to a million tons per annum.

It is not my purpose, however, to enter into historical details as to discovery, growth, etc., except very superficially; but rather to confine my remarks mainly to only such information and discussion as I have reason to believe will prove to be of practical value and interest to you as engineers. Mindful of the fact that, in these busy days, only rarely has the engineer had the opportunity or time to familiarize himself with the details of the process of manufacturing these castings, coupled with the necessity of being somewhat acquainted with them before certain facts that I desire to make clear can be explained, we will first take up in a very brief manner the process itself, discussing it in as non-technical a manner as possible. However, before we can take up this matter intelligently, it is first necessary to understand in what manner an iron that is white in fracture differs from one whose fracture is gray.

Research has shown that if carbon be introduced into a bath of pure iron it will dissolve, and after solidification has taken place, it will be found that in accordance with an inflexible law, the carbon has combined chemically with a definite portion of the iron. This chemically combined carbon and iron is popularly called *carbide-of-iron*, a constituent, which although made up of comparatively soft iron and very soft carbon, differs from both in that it is extremely hard and brittle, harder even than any constituent found in hardened steel. White iron contains this compound in large proportion, which serves to explain why such iron is so hard and brittle and so white in fracture. The foregoing holds true in all cases where carbon is introduced into a bath of pure iron, and also where the bath of iron may contain a limited amount of impurities, some of which actually favor the chemical union of the carbon and iron; some being inert to this action, and some tending to inhibit it if present in sufficient quantity.

A reasonable amount of phosphorus, for example, is inert to this action, sulphur and manganese favor it, while if silicon is present in excess of a certain quantity it prevents the union of the carbon with the iron and forces the carbon to separate out as graphitic flakes of irregular size, distributed more or less uniformly throughout the mass of metal.

When there is sufficient silicon in the bath to cause this to happen, the fracture of the metal is invariably gray. In short, when we see an iron white in fracture, we can at least be sure of the fact that silicon is present in comparatively small amount and that the carbon present does not exist as such in the iron, but has combined with a definite part of the iron to form the hard and brittle constituent called carbide-of-iron; while if the fracture is gray, we then know that most, if not all, of the carbon exists in an uncombined state, in the form of flakes as previously described, and that the silicon must have been high enough to have prevented the chemical union of the carbon with the iron.

Those of you who can hark back to the time when you first studied metallurgy, will recall that in the early days, the first iron successfully run from the tap hole of a blast furnace—the first pig iron ever made and for many years afterwards the only kind made—was described as being white in fracture, as brittle as glass and also proved to be extremely hard.

This characteristic disappointed the furnaceman who had hoped to pour this iron into molds, and thus make castings which would serve to lessen the arduous labor of the smiths, who prior to this and for some time afterwards had to fashion all shapes from blooms by the sole aid of muscle and forge fire. This pig iron was white because in

FIG. 5—TEST HAMMER

Presented Feb. 25 before the Railway Club of Pittsburgh.

those days hot blast was unknown. The blast outfit was a toy as compared with present day equipment. The result was that the furnacemen were restricted to furnace temperatures far under what was necessary to produce a silicon content in the pig iron high enough to prevent the carbon from combining chemically with the iron.

Gray iron had never been made, and the furnacemen knew nothing of its characteristics or possibilities, or even that it could be produced by increased furnace temperatures. The discovery was fortuitous and the knowledge came by degrees as improvements in furnace, equipment, and fuel took place during the succeeding years.

The attempt to make serviceable castings from this hard and brittle white iron was probably abandoned, at the start, until it occurred to some one to see if this brittleness and hardness could not be moderated in some manner, former to 88 per cent of the latter, called by the metallographist *pearlite*. Actually, therefore, the structure consists of but two elemental substances, the hard carbide-of-iron, and soft iron free from any carbon whatever.

We have seen under what conditions soft iron and very soft carbon can unite to form a chemical compound as hard as quartz. Fortunately, it has been found that this compound is not stable when exposed to a high temperature, and if it be heated long enough at such a temperature it will split up into its two original soft constituents. Thus the result of this heat treatment is that we obtain a structure consisting of a ground mass of very soft and ductile iron throughout which is uniformly distributed small nodules of free carbon, as is shown plainly in Fig. 2. By comparing Figs. 1 and 2, the profound change that takes place through heat treatment will be immediately apparent.

if the average carbon in the mixture is too high to produce the best results. In by far the largest majority of cases, this mixture is melted in a reverberatory furnace, commonly known as an air furnace, from which the average sized heat is tapped every four or five hours.

If during a heat, a test bar were poured when the charge was just melted, the fracture would be gray; because the silicon is still high enough to prevent the carbon from remaining permanently combined with the iron after solidification. However, by holding the metal in the furnace, the oxidizing action of the furnace gases gradually lessens the silicon in the bath, and a point is finally reached where the chemical union of the carbon and iron is definitely attained. If a bar is then poured and its fracture examined, it will be found to be uniformly white throughout. When this stage of the operation has been reached, the metal should be very hot

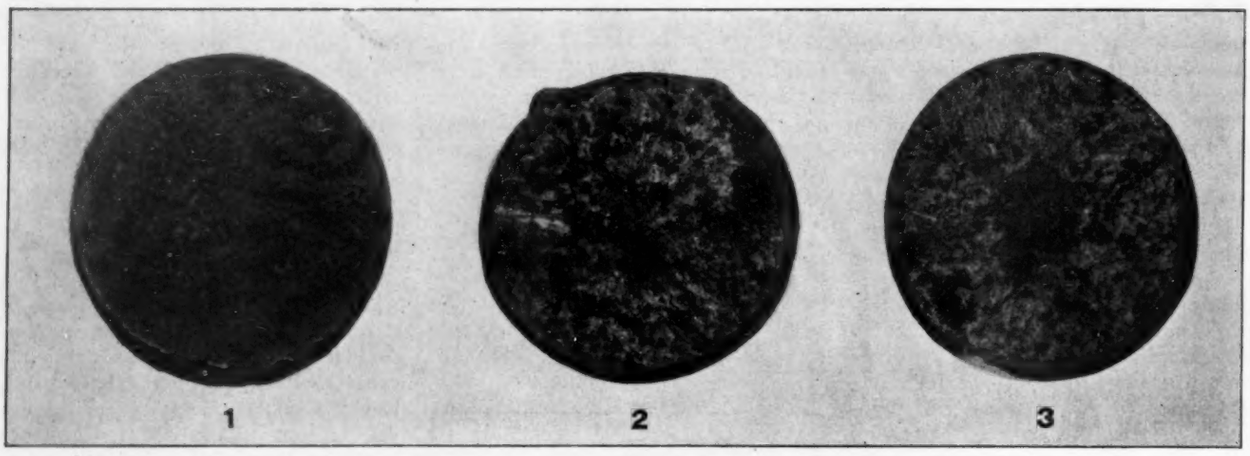


FIG. 6—FRACTURE ENDS OF TEST BARS POURED AT DIFFERENT INTERVALS DURING A HEAT

and a greater strength obtained through a prolonged heating of the castings. This was found to be beneficial, and while the treatment was very incomplete as compared with present day practice, it really marks the beginning of the effort to convert white iron castings into ones that are strong, tough and ductile.

The question of paramount interest to you now is why a prolonged heating, at a certain temperature for a certain interval of time, will change an extremely hard and brittle casting into one that is both soft and strong and whose fracture will be black. This we will undertake to explain in part by aid of Fig. 1, in which is shown the typical structure of white iron. The white areas are the hard and brittle constituent carbide-of-iron, called by the metallographist *cementite;* the dark are mechanical mixtures of this same constituent and of iron free from carbon, in the proportion of 12 per cent of the

While this change seems easy enough to accomplish in practice, certain precautions must be exercised in connection with the composition of the white iron. Although it has been pointed out that the hard carbide is unstable under a high temperature, the statement must be modified somewhat by stipulating that the degree of stability depends largely upon the composition of the white iron. Either low silicon or low carbon seems to stabilize the carbide and prevent its being broken up into its two soft constituents by heat treatment, while high silicon and high carbon facilitate its decomposition. By proper adjustment of these percentages, and attention to a few other details to which I will refer later, the manufacturer can control his product with intelligence.

Commercially, the malleable iron process is conducted in two steps. The first step consists in making a mixture of gray iron, sprue from some previous heat, and possibly an addition of steel

and fluid enough to pour easily the smallest castings without danger of misruns. The silicon and carbon should be still high enough to make the carbide-of-iron as unstable as possible. If the silicon or carbon is too low, then their initial percentages in the mixture were deficient.

In Figs. 6 and 7, are shown the fractured ends of a series of test bars poured at various stages of the heat; starting with No. 1 when the metal was just melted and afterwards at about 20 minute intervals until the furnace was ready to tap. You will notice how the fractures grow progressively whiter from the all gray to the all white one.

The first step in the process as previously pointed out, is to make white iron castings from a mixture of gray iron, simply because if we started with a white pig iron mixture, the initial silicon would be so low that the resultant carbide-of-iron would be too stable to be successfully malleablized,

that is, changed by heat treatment into soft iron and free carbon.

The second step in the process of making malleable iron consists in heating the white iron castings to the proper temperature for a certain length of time, for the purpose, as previously explained, of making them soft and strong.

This is accomplished in practice, by placing them in cast iron pots, where they are surrounded by a packing which should contain more or less oxide of iron. The joints and top of the pots are well luted in order to exclude air, and they are then charged into annealing ovens of appropriate design. The packing serves the double purpose of protecting the castings from serious oxidation through contact with the air, while at the same time it has, inherent in its composition, enough oxygen to enable the packing through its intimate contact with the casting surfaces, to eliminate some of the carbon from them

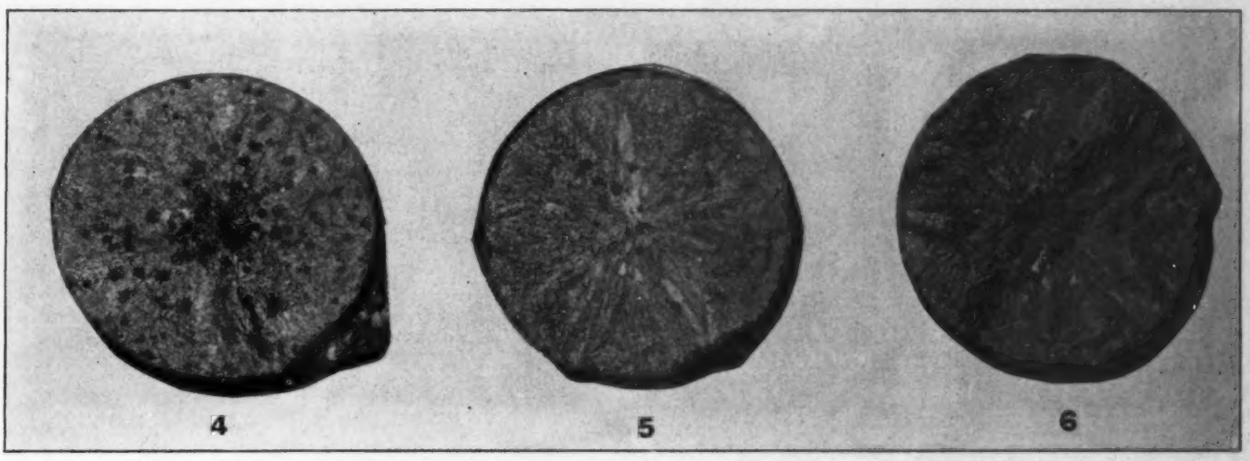


FIG. 7—FRACTURE ENDS OF TEST BARS POURED AT DIFFERENT INTERVALS DURING A HEAT

without causing any scale to form on these surfaces.

We will not at this time enter into reasons why a certain definite temperature should be selected for the annealing operation. For the present, it is sufficient to say that the endeavor is to heat the castings up to at least 1,450 degrees Fahr., hold them at that temperature for at least 60 hours, and then allow the oven to cool with extreme slowness for a period of at least three days.

Now that we have outlined in brief manner the essential details of the process of manufacture, we will take up certain matters in connection with the castings themselves that I know are uppermost in your minds, and then discuss other matters that are uppermost in mine.

We will take up the items as follows:

First—The physical properties of the malleable iron casting, in order that you may be in a position to compare its characteristics with those of other castings.

Second — To the exposé of certain fallacies in connection with the structure of this metal and the process itself.

Third—To suggestion which if carried out will result in a better understanding, and prove of mutual benefit to both the engineer and the maker of the castings.

Fourth.—To some quite recent but very important changes in business policy adopted by a large number of manufacturers of these castings.

Fifth—The abuse to which these castings have been subjected due to numerous causes.

Considering these items in the order given, we will take the first one and point out what are acknowledged to be the desired physical characteristics that should be inherent in any casting. You will then be in a position to note through a comparison of these characteristics with similar ones possessed by the malleable casting, to what extent it approaches or falls short of this ideal standard, that is, what the virtues or shortcoming of these castings may be.

The ideal casting should possess the following characteristics:

First.—It should cast free from blowholes, in order that the engineer at all times is sure that the net section at any part of a casting is equal to the gross section at that part, and in order that the purchaser will feel confident that having spent a certain amount of money in machining it, he will not be obliged to scrap the casting through the discovery of blowholes or failure of the casting in service.

Second.—The metal from which the casting is made should be very fluid when hot, and should have minimum contraction when cooling from solidification to atmospheric temperature.

Third.—The metal should machine kindly at a high rate of speed and fair feed, the machined surface being glossy and smooth.

Fourth.—The structure should be normal for the particular metal in question, and the grain size should be the finest possible.

Fifth.—The metal being ductile, the closer the elastic limit approaches the ultimate strength, the better the metal.

Sixth. — The compressive strength should be high.

Seventh. — Under stress, the metal should flow kindly when the elastic limit is exceeded, that is, should act well under drift test.

Eighth. — The castings should be capable of standing great abuse under shock.

Ninth.—The metal should be rust resistant.

Tenth—The cost per pound should be low.

Considering these items in their relative order, we will note how the malleable iron casting measures up when compared with each particular characteristic.

Freedom from blowholes—In this connection, I believe it will be freely acknowledged that the malleable casting can lay claim to superiority, for it is a rare occurrence to find one containing these costly and annoying defects. This absence of blowholes should be anticipated from the nature of the metal that enters into the composition of these castings.

The silicon content is extremely abundant, and the carbon very high, both factors making for soundness and a metal which easily frees itself from occluded gases.

Fluidity and minimum contraction—The factors that make for fluidity are first carbon, then phosphorus and then silicon. These castings contain never less than 2.40 per cent carbon; for railway castings the silicon will average at the present time about 0.90 per cent;

while owing to the fact that the structural composition of malleable is practically all iron, free from combined carbon, the phosphorus can safely be as high as 0.250 per cent, because it is the presence of combined carbon seemingly, that exaggerates the harmful effects of that element. Good castings can be made from this metal as thin as ordinary cardboard. The metal contracts ¼ inch to the foot when cooling from solidification to atmospheric temperature. This of course is high.

Machining properties and machined surface—The production engineer can bear testimony to the ease with which malleable iron can be machined, and the character of surface left after machining.

Grain size—All castings as cast must of necessity be coarse in structure, that is their crystalline grains will be large in size, because the final grain size depends upon the temperature from which the metal cooled and the rate of cooling. Assuming that the rate of cooling has been the same in each case, the structure of a steel casting will be more coarse than in the case of a malleable iron or gray iron casting, simply because its temperature of solidification is 400 or 500 degrees higher than that of either of the other two. It is however possible, though it adds to the expense, to get rid of this coarse crystallization and replace it by crystaline grains of exceedingly fine size, simply by heating the casting to about 800 degrees Cent. and holding at that temperature until the molecular rearrangement has been completed, thus converting a casting that would be wholly untrustworthy under shock, into one that would be entirely dependable. This operation is called *grain refining* or *annealing*. To illustrate the effects of temperature on grain size, compare Fig. 3 with Fig. 4, both taken at the same magnification. The former is taken from a shell that was heated to forging temperature, and the latter from the same shell after it had been reheated to about 800 degrees Cent.

In the manufacture of malleable iron, the casting as cast is very coarsely crystaline, and I have already explained that when cast the iron is brittle and white and that it must be heated for some eight days at a certain temperature in order to convert it into one that is soft, strong and ductile. Now it happens that the temperature at which the castings must be held in order to accomplish this object, coincides exactly with that temperature which yields the finest crystalization in the casting. Thus without effort or aim on the part of the manufacturer, the refining of the grain is automatically carried on by virtue of the process required to convert the brittle casting into one that is tough and ductile.

Elastic limit and ultimate strength—The elastic limit of a metal is measured by a load per square inch, such that when released, the tested specimen is found to have been stressed sufficiently to lengthen it by thousandths of an inch only. It is the load per square inch that is just sufficient to permanently deform. For this reason, it is a factor that the engineer must know with certainty, because a high ultimate strength is of little special value to him if the structure he is building is going to alter in shape at a load far under that which will cause the members to break. Consequently, the nearer the elastic limit approaches the ultimate strength, the more load the structure will stand without fear of deformation, or in other words, it is better to have a metal with high elastic limit and a comparatively low ultimate strength, the metal being assumed to have sufficient ductility in each case not to be brittle. The elastic limit of fair quality malleable iron is easily 29,000 pounds per square inch, and its ultimate strength in the majority of cases will be in excess of 44,000 pounds per square inch, that is its useful strength is high, especially for a metal whose structural composition is mostly carbonless iron.

Compressive strength — The compressive strength of malleable iron is not high, being about equal to that of wrought iron or soft steel. Its elastic limit in compression is about equal to that in tension. *Metal should flow with facility under stress, when elastic limit is exceeded.* This is a property of much value in a casting that is to be used in car construction, as it is often necessary that the casting be riveted or bolted to a frame or other part, and if the drilled or cored holes do not register with the ones to which they are to be connected, they must be able to stand drifting without danger.

That the metal in a malleable iron casting can stand such treatment is shown in Fig. 8. These four plates are

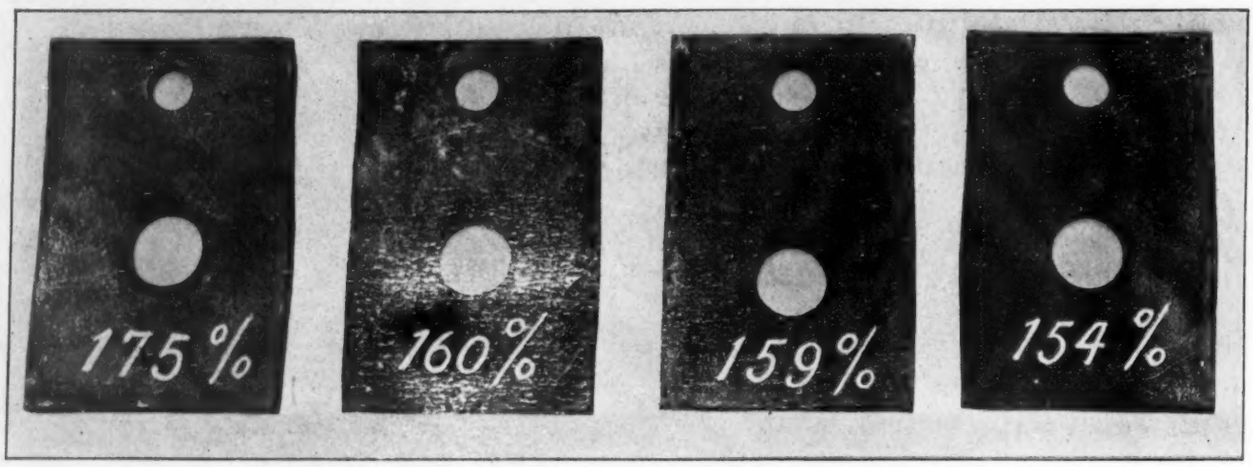


FIG. 8—TEST SHOWING HOW MALLEABLE IRON WITHSTANDS DRIFTING

⅜-inch thick, and through each plate 2¾-inch holes have been drilled. A drift pin was then inserted into one of the holes in each plate and the hole drifted until its surface was seen to just check. By comparing the dimensions of the enlarged holes with the originals, a fair idea will be obtained as to the ability of this metal to stand such treatment. In another test, a wedge was placed under the drop of a test hammer, as shown in Fig. 5. It was placed on the anvil, held upright, and tested by allowing the weight which delivers a blow of 70 foot pounds to fall on its thin end until fracture took place. More than 60 such blows were required to break the wedge. Corrugations appeared at the side of the wedge, which were caused by portions of the metal slipping over contiguous parts. This surely indicates that when the metal is good, its ability to flow under excessive stress is remarkable.

(To be continued.)

Contract for Open Hearths

The Pacific Coast Steel Co. has awarded a contract for two 60-ton open hearth furnaces for its plant at South San Francisco, Cal. These are expected to bring the output of the plant to 500 tons per day. In connection with this added open hearth capacity a 36-inch blooming mill is to be built, and the range of structural shapes will be increased to include 15-inch I beams.

At the Seattle plant of this company one 60-ton furnace is to be built, which will bring the output to 11,000 tons per month. California petroleum is used for fuel.

Seeks Uniform Law

The American Uniform Boiler-Law Society has issued the first of a series of bulletins which will show the progress made by the society in its campaign for the legal adoption of the boiler code of the American Society of Mechanical Engineers. Bulletin No. 1 calls attention to the fact that manufacturers of boilers in applying for the A. S. M. E. boiler stamp must furnish an affidavit that the stamp will be used only on boilers built in accordance with the A. S. M. E. code. The society has started active campaigns for the adoption of the code in several states and in New York, New Jersey and Virginia bills are now pending. Similar legislation will be introduced in Maryland and Rhode Island in the near future.

Bronze Group Cast

A bronze cavalry group of heroic size for the General Grant monument at Washington, D. C., has been completed by the Roman Bronze Works, 275-289 Greene street, Brooklyn, and was exhibited to the public during the afternoons of Feb. 24 to 26. The group, of which Henry Merwin Shrady is the sculptor and Edward Pearce Caset, architect, is 28 feet long, 10 feet wide, 12 feet high and weighs 31,400 pounds. Sometime ago the Roman Bronze Works completed the artillery group, which is now in place on the Grant monument. This piece is 28 feet long, 10 feet wide, 11 feet high and weighs 28,600 pounds. These are the largest bronze groups ever cast and erected in America.

Doubles Capacity.—The V. & O. Press Co., Glendale, L. I., manufacturer of sheet metal-working machinery, power presses and dies, recently added to its plant a 1-story, saw-tooth building of mill construction, which has more than doubled its capacity. The increase in the demand for the company's standard product has taxed its facilities for more than a year. The new addition will be in operation about March 1. This company has been able to keep pace with its growth by anticipating the required increase of facilities.

Will Purchase Bolt Plant

R. A. McDowell, of Louisville, Ky., is authority for the announcement that the Louisville Steel & Iron Products Co., with a capital of $1,125,000, has been incorporated under the laws of Arizona, and that the company will purchase and rehabilitate the old plant of the Louisville Bolt & Iron Co., in South Louisville, disused for six years. O. C. Carter, Chicago, formerly general freight agent of the Monon railroad, is president, Mr. McDowell vice president and general counsel, and George H. Holzbog, of Jeffersonville, Ind., secretary and treasurer. Mr. Holzbog and associates have been owners of the property. The plant will produce sheet and bar steel and sheet and bar iron, Mr. McDowell stated, and it is planned to begin active operations shortly. The capital is largely held outside of Louisville, it is stated.

Will Make Sand Cutting Machines

A plant for the manufacture of their lines of sand cutting machines and sand blast equipment, has been established at 11 Power avenue, Cleveland, by the Sand Mixing Machine Co. and the American Foundry Equipment Co. and operations now are being inaugurated. Heretofore, those companies have not been manufacturers, but have had their equipment made at other plants. A complete line of repair parts for both lines of equipment will be carried at the Cleveland plant. H. L. Wadsworth who has been the head of the American Foundry Equipment Co., will be in charge of the new plant as factory manager while C. L. Benham, who has been connected with the Sand Mixing Machine Co. for a number of years, will be superintendent.

Lets Equipment Contract

The Ashland Iron & Mining Co., Ashland, Ky., of which W. B. Seaton is president, has let a number of important contracts in connection with the erection of its proposed open hearth steel works. It has placed a contract for a 36-inch blooming mill with the United Engineering & Foundry Co., Pittsburgh. The reversing motor as well as other motors have been placed with the General Electric Co. The Mt. Vernon Bridge Co. has taken the contract for the structural steel, as mentioned previously in *The Daily Iron Trade and Metal Market Report.* S. R. Smythe Co., Pittsburgh, will superintend the erection of three 75-ton open hearth furnaces. The works will include also two soaking pits.

Plans Extension

Improvements and extensions to the plant of the National Tube Co., at Lorain, O., outlined briefly by Steel Corporation officials early in January, include the installation of four open hearth steel furnaces, each having a capacity of from 80 to 90 tons; 210 by-product coke ovens; a 40-inch motor-driven blooming mill and accessories. Plans are being made to utilize waste gas from the blast furnaces for driving gas engines.

Obituaries

Edward Franklin Pierson, who with his brother General John F. Pierson, has been engaged for many years in the metal manufacturing business, died Feb. 23, at Ramapo, N. Y., aged 83 years. Mr. Pierson was director of the Ramapo Foundry & Wheel Works. He retired several years ago.

Charles Henderson Bradley, a mechanical engineer with offices at 79 Milk street, Boston, died at his home in that city on Feb. 21, following an illness of a week. Mr. Bradley was 43 years of age. He was associated in an executive capacity with the Erie City Iron Works, Erie, Pa.

Edward I. Leighton, a prominent manufacturer of Cleveland, died suddenly last Saturday at St. Augustine, Fla. Though retired from active business 15 years ago, he still was identified at his death with the Acme Mfg. Co., the Van Dorn & Dutton Co., the Van Dorn Electric Tool Co. and the Reliable Machine Co., all of Cleveland. He also was instrumental in organizing the Hydraulic Pressed Steel Co. and the Cleveland Machine & Mfg. Co., of that city. Mr. Leighton at one time was identified with the company now known as the Cleveland Punch & Shear Works Co. His son, Thomas A. Leighton is purchasing agent and assistant treasurer of the Van Dorn & Dutton Co.

A number of molders employed at the plants of the Carbon Steel Casting Co. and the Hubley Mfg. Co., Lancaster, Pa., went on a strike Feb. 21.

Business News of Nation's Capital

Complete Revision of Maritime Laws Proposed by Congressman McArthur of Oregon

Iron Trade Review Bureau,
206 Corcoran Bldg.,
Washington, Feb. 29.

Complete revision of the maritime and navigation laws of the United States would be effected if the bill introduced in the house by Representative McArthur, Republican, of Oregon, should be passed. The bill provides for a centralized control over the construction, classification, equipment, operation and manning of vessels. The control would be exercised by a board consisting of the supervising inspector general of the steamboat inspection service, the commissioner of navigation and five men to be appointed by the President. Salaries would be placed at $10,000 a year for the appointive members of the board.

Would Revise Shipping Laws

"The object of this measure," he said, "is to bring about a thorough revision of the navigation and shipping laws of the United States, based upon reports made by a commission of high salaried experts, who are to give this great subject their undivided attention and make recommendations that will restore our merchant marine and modernize our shipping and navigation laws. There is a widespread demand for legislation of this character, and I have offered the bill after lengthy study and consideration of the general subject and consultation with shipping men of wide experience.

Congress has not enacted much constructive legislation on this subject, but in view of the widespread interest in ship building and the great possibilities in store for our commerce with foreign countries and for restoring the American flag to the seas, the time has come when something should be done. The ship purchase bill of the administration is doomed to defeat, but there should be something in the nature of a substitute that will clear up the situation and enable congress to receive first hand information from an official board that will be qualified to speak intelligently and to make able recommendations for shipping legislation.

Rate on Rivets

Washington, Feb. 29.—The Garland Nut & Rivet Co., Pittsburgh, has filed a complaint with the interstate commerce commission protesting against a tariff which names a rate of 75c per 100 pounds on rivets from Pittsburgh to Seattle, Wash., with a minimum carload of 80,000. The complaint asks that the commission require the railroads to restore the previous carload weight of 40,000 pounds on iron rivets not less than ½-inch in diameter. It is pointed out that small rivets range in diameter from ⅛ to 7/16-inch and that it requires from 5,000,000 to 8,000,000 pieces of such rivets to load an 80,000-pound car. Due to these loading requirements, it is asserted, the coast trade of the complainant has been jeopardized to such a grave extent that it is now practically impossible to obtain carload business in that territory. This condition is said to be detrimental to the ordinary sized manufacturer and, it is added, can only possibly be of benefit to the few large manufacturers who are in position to maintain warehouses.

Opposes Purchase Bill

Washington, Feb. 29.—John A. Penton, president of the Penton Publishing Co., Cleveland, appeared last Saturday before the house committee on merchant marine and fisheries in opposition to the administration ship purchase bill. It was his view that the only way in which the American merchant marine can be rehabilitated is through government aid. He contended that all congressional appropriation bills, while worthy, carry subsidies; and, moreover, said that the rate of postage charged on publications, being less than the cost of their transporation, constitutes a subsidy. Being in the publishing business himself, he said he felt that he ought to know what he was talking about, and said he is in favor of the preesnt rate of postage because he benefits from it.

Chairman J. W. Alexander, of the committee, agreed with the witness that the postage rate does not cover the cost of transportation and said he thought that it cost the government 4 cents a pound to carry publications, whereas the rate is 1 cent.

"Then that means publishers of this country receive an annual subsidy of $33,000,000," said Mr. Penton, "inasmuch as there is carried 1,100,000,000 pounds of that kind of mail each year." The witness insisted that he does not think there is as much antagonism against ship subsidy as some people imagine.

Mr. Penton, who was the first secretary of the Merchant Marine League of the United States, organized in Cleveland, said he thought if the committee told the business men of the country to come before it and promised them the right kind of help, not merely millions of dollars but hundreds of millions of dollars would be invested to build up an American merchant marine.

Mr. Penton was asked as to the ability of ship builders on the great lakes to build vessels quickly and surprised the committee when he recited the rapidity with which they build a vessel. He cited one instance where a 10,000-ton vessel, from keel to the time it went under steam, was built in 10 weeks. The ability to build rapidly, he said, was due to the fact that the types of boats built are standardized and that it is only a question of getting the material.

Replying to a question by Representative Hardy, it was stated by Mr. Penton that, because of abnormal conditions brought about by the war, vessels could be built about as cheaply in this country as in foreign countries, but explained that the situation is not permanent because it would be different after the war is ended. He also told Mr. Hardy that, under the present abnormal conditions, by which carrying rates have been increased from 500 to 800 per cent, it would not require subsidies to build up a merchant marine, but, it was pointed out, it is the future which must be kept in mind. The cost of American labor and material being higher than that in any other country, it was maintained by Mr. Penton that something to offset the difference was necessary to make the American merchant marine a permanent institution.

Occasion was also taken by Mr. Penton to say that the present is the most inopportune time imaginable to enact the government ship purchase bill.

Iron and Money: Fact and Comment

Declines in Many Stocks—Foreign Affairs Apparently Have Considerable Influence in Wall Street

THE past week was, to a large extent, one of declining values on the stock exchange. This seemed to be without good reason. Of course, there was considerable anxiety, due to the controversy between the President and congress relating to foreign affairs and to the fear that diplomatic relations with Germany would not end satisfactorily, but it was difficult to trace logical connection between the movement on the stock exchange and events at Washington and Berlin. The market seemed to be in a condition to slump and to be determined to do so, and it completely ignored the decision in the American Can Co. case, which in other periods would have been considered highly satisfactory and as forming capital argument for the bulls.

There were no important developments Monday, and Tuesday was Washington's birthday.

Wednesday, the Washington-Berlin controversy received much attention on the stock exchange. It was announced that the Du Pont Powder Co. will distribute $16,000,000 in Anglo-French bonds, that being a 19 per cent dividend, while a 5 per cent cash dividend will also be declared. The Baltimore & Ohio's earnings statement for January indicated a net gain of $516,000, while Southern Pacific reported a loss of $335,000. The latter was probably influenced by unfavorable weather and by the fact that in January last year a considerable increase in profits was due to the exposition.

Thursday there was further decline and at the close of the day industrials were down from one to six points. Anglo-French 5's were offered in large volume and declined to 94. Probably the success of the German movement toward Verdun was a factor, but the decline was usually credited to the coming distribution of bonds by the Du Pont company.

Friday there was a tendency to advance, but there was still some anxiety in regard to foreign complications. The report of the Atchison for January indicated an increase in net earnings of $182,000.

Declines were general in the short session Saturday. The bank statement was not received with favor by Wall street, as the New York City banks reported an increase in loans of more than $59,000,000, while surplus reserves decreased $17,000,000. Railroad securities were, as a rule, stronger than other industrials. Reading was particularly strong.

Quotations at the close of business Feb. 26 and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

	Close Feb. 26.	Net Change.
American Can	61½	— ⅜
American Can, prfd.	111¼	.....
Amer. Car & Fdy.	68	—1⅞
Amer. Car & Fdy., prfd.	118	.....
American Locomotive	69	+4
American Locomotive, prfd.	102	.....
American Steel Foundries	53	—1⅜
Baldwin Locomotive	104½	—4
Baldwin Locomotive, prfd.	109½	+ ½
Bethlehem Steel	470	—9½
Colorado Fuel & Iron	43	—2
Continental Can	80½	— ¼
Continental Can, prfd.	106	.....
Crucible Steel	76¼	—3¾
Crucible Steel, prfd.	113½	+ ¼
General Electric	169¾	—1¼
International Harv. of N. J.	109½	— ¾
International Harv. Corp.	68¼	—1¾
Lackawanna Steel	77½	.....
Nat'l Enamel'g & Stamp. Co.	25	—1½
Pressed Steel Car	55	—1½
Pullman Palace Car	162½	—1
Republic Iron & Steel	51½	—1⅜
Republic Iron & Steel, prfd.	110	—1
U. S. Cast Iron Pipe & Fdy.	17	—1⅛
United States Steel	82⅞	—1
United States Steel, prfd.	116¾	— ¼
Westinghouse Mfg.	64⅞	—1½

The following table shows changes in maximum quotations of stocks not listed on the New York stock exchange:

	High Feb. 25.	High Feb. 18.
American Radiator	395	395
American Ship Building	40	40
Cambria Steel	81	81¼
Chicago Pneumatic Tool	72½	73¼
La Belle Iron Works	51	51
Lake Superior Corpn.	11¾	12½
Pennsylvania Steel	76	90¾
Stewart-Warner Speed Co.	87¾	88½
Warwick Iron & Steel	10½	10½
Westinghouse Air Brake	139½	139½
Westinghouse Elec. & Mfg.	66¾	67½

Purchased by Syndicate

It is announced by the Scherzer Rolling Lift Bridge Co. that following the death of Albert H. Scherzer, president, the entire stock of the company has been purchased by a syndicate of officials of the company who have been connected with the business from its inception and that there will be no change in the personnel of the organization, Mr. Scherzer having taken no active part in the affairs of the company for several years.

By-Products Coke Co. Report

The By-Products Coke Co., Chicago, reports gross earnings of $780,724 for the year ended Dec. 31, 1915, as compared with $509,343 in 1914. This was after deducting operating expenses and coats of material. After all charges and depreciation, a surplus for dividends amounting to $309,962 remained, compared with $178,720. Bonus to employes amounted to $17,315, as compared with $6,580 in 1914. The improvement in the iron and steel industry and consequent increase in coke consumption, together with increased demand for coal tar products were favorable factors in the company's earnings. The income account compares as follows:

	1915.	1914.
Total earn. from oper. tion of Chgo. plants.	$768,544	$472,480
Earn. from invest.	12,180	36,863
Gross earnings	$780,724	$509,343
Total exp. and taxes.	172,739	176,865
Net earnings	$607,985	$332,478
Less deprec. and adjustment of accts.	298,023	153,758
Balance	$309,962	$178,720
Bal. of undivided earnings, Dec. 31, 1914.	404,789	388,513
Total	$714,751	$567,233
Less divs. paid May, Aug. and Nov.	136,381	*155,864
Bal. of undiv. earn.	$578,370	$411,369
Deduct:—		
Div. of $1.00 per share payable Feb. 15, 1916	52,353	.....
Extra div. of $150 per share payable Feb. 15, 1916	78,530	.....
Bonus to employes.	17,315	6,580
Total	$148,198	$6,580
Balance	$430,172	$404,789

*Dividends for four quarters.

The acquisition by the company during the year of the Federal Furnace Co. of Chicago is reflected in the balance sheet by an increase in total assets and liabilities. The stock outstanding on Dec. 31 amounted to $5,235,300, compared with $3,896,600 a year previous. The bonds outstanding consist of $2,000,000 By-Products Coke bonds, unchanged, and $1,245,000 Federal Furnace bonds, a new item in the balance sheet. Plants, real estate, etc., are valued at $6,878,269, against $4,421,505 at the end of 1914. Cash amounts to $278,744, against $304,357.

The Wagner Electric Mfg. Co., St. Louis, has opened offices in the Mills building, El Paso, Tex., in charge of F. B. Hitchins, manager.

High Prices Paid for Properties

Bought by American Can Co. to Establish Monopoly

United States Court Says Buyer's Hands Always Dropped Gold—Refuses to Order Dissolution on Account of Changed Policy of Past Few Years—Retains Case for Possible Further Action

THE decision of Judge Rose in the district court of the United States, district of Maryland, in the case of the government against the American Can Co., handed down at Baltimore last week, has been received with approval by the representatives of the department of justice, but they have not indicated whether they will acquiesce in the decision or appeal to the Supreme Court. Attorneys for the company have not expressed any opinion concerning the decision.

The document prepared by Judge Rose is the result of long consideration and much labor and reviews at great length the history of the organization of the Can company. The government put 346 witnesses on the stand and the company 516 witnesses. The record covers more than 8,700 printed pages and the opinion of the court consists of 76 typewritten pages. Early in his decision, Judge Rose made the following statement as to what was proved.

"What has been proved is, First: that the defendant was organized to monopolize interstate trade in cans, and to attain that object such trade was unlawfully restrained by it, and by those who formed it and directed its earlier activities, and that some of those individuals still participate in its management and control. Second: for some time before the filing of the petition in this case, it had done nothing of which any competitor or any consumer of cans complains, or anything which strikes a disinterested outsider as unfair or unethical."

Referring to the personnel of the men who really brought about the organization, the judge says that there were apparently not more than five, and only one of them, Edwin Norton, was a can maker. "He did practically all the work of persuading, inducing or coercing the can makers to sell out," says the court. Judge Rose refers to Daniel G. Reid; and "one William B. Leeds, now dead," and adds, "counsel have said that Norton is also dead, although that fact does not appear to be stated in the records". Judge Rose then traces the history of the organization of the American Can Co. and gives much attention to the buying of the plants. Concerning prices paid for plants, the court says:

Prices Paid Liberal

"As a rule, the prices paid were liberal, not only to the verge of extravagance, but in cases almost beyond the limits of prodigality. If Norton sometimes showed the can makers that there was steel in his scabbard, his hands always dropped gold. The record does not disclose a single case in which the price named in the option did not exceed the value of all the tangible property transferred. The amounts paid appear to have ranged all the way from one and a half to 25 times the sum which would have sufficed to have replaced the property sold with brand new articles of the same kind. Before agreeing on the figures to be inserted in an option, Norton does not appear to have taken the trouble either to make, or cause to be made, any inspection or appraisement of the plant to be transferred. Under such circumstances the ratio between the real value and the price named depended upon the nerve or the impudence of the seller, than upon any estimate of his property's probable worth to the new combination.

"The defendant has no record of what was paid for the different plants so acquired. Wherever the seller was still alive, could be located and was in physical and mental condition to testify, the government has proved by him what he received for his property, and so far as he could or would tell, what it had cost him. In some cases the former information, in many the latter could not be obtained.

"From a careful study of what the record discloses, I have reached the conclusion that the amount which the promoters agreed to pay for the plants taken over through them, was probably somewhere around twenty-five millions, of which not more than twenty-three millions and a half was given for the 95 plants turned over to the defendant on the day after it was organized. It is certain that for half, and not improbable that for a third or less of that money, defendant could have purchased land, erected buildings and equippeed them with machinery which would have had a greater capacity, could have been operated at a smaller cost, and would have been at least as well, if not better located with reference to the needs of the consumer and the facilities for transportation."

Concerning the purchase of tin plate at preferential prices, the judge says that all the tin plate company was willing to do was to bind itself to sell tin plate to the defendant at a certain fixed figure, below the price at which it sold to any one else. This preferential discount or rebate amounted, when the published price of tin plate was $3.50 per base box, to 64 cents on the quantity of plate required to make 1,000 three-pound packers' cans.

The court discusses what it calls the prompt and wholesale dismantling of plants and says that there can be no possible explanation of such transactions except that the defendant and its promoters wanted to extinguish competition and did not stop to inquire how much it would cost to do so.

The court shows how, in spite of all the efforts of the American Can Co., competition in time became very active. The company attempted to keep up the price of cans and even went so far as to send brokers into the market to buy some millions of cans from its rivals. These cans were stored for a while and ultimately such of them as were saleable at all were sold for what they would bring.

Referring again to preferential treatment of the American Can Co. by the American Sheet & Tin Plate Co., the court says that it has often been possible in recent years for some competitors of the American Can Co. to buy tin plate from the so-called independents at some cents below list figures. The preferential prices made by the American Sheet & Tin Plate Co. ended in April, 1913, some seven months before this suit was brought. "The defendant still buys its tin plate," says the court, "at prices lower than the quoted list prices of the tin

plate company, but it no longer has a right to require the tin plate company to allow it such a reduction below any price at which the tin plate company may sell to others." The preferential rebates received by the defendant from the tin plate company in the period from 1902 to 1913 amounted to $9,000,000.

Concerning control of prices of cans, the court says there is no question that since 1901 the defendant has very largely fixed the price at which packers' cans have been sold throughout the United States, but it now has competitors which sell about half the cans which are sold in the country, and there is no evidence of any price agreement between it and them.

The defendant devotes much of its defense to showing that on the whole it has served the can trade well and that its dissolution would do harm rather than good. The court finds that there have been many improvements since 1901, not only in can making, but in can selling and in can delivery as well, but it is difficult to determine how much of this improvement is due to the defendant and how much would have come about if it never had been thought of.

Judge Rose next takes up a discussion of the policy of the government toward business and says that congress wished to preserve competition, because among other reasons it did not know what to substitute for the restraint competition imposes. "It has not," says Judge Rose, "accepted the suggestions of some influential men that the control of a certain percentage of the industry should be penalized. It has not yet been willing to go far in the way of regulating and controlling corporations merely because they are large and powerful—perhaps because many people have always felt that government control is in itself an evil, and to be avoided whenever it is not absolutely required for the prevention of greater wrong."

Referring to dissolutions, the judge says that a number of great and powerful offenders have been dissolved, and he adds, "so far as it is possible to judge, the consuming public has not as yet greatly profited by their dissolution. It is perehaps not likely that any benefit could have been expected until in the slow course of time the ownership of the newly created corporations gradually drifts into different hands. In most of the cases in which dissolution has been decreed, the defendants had, not long before the proceedings against them were instituted, done things which evidenced their continued intent to dominate and restrain trade by the use of methods which interfered more or less seriously with the reasonable freedom of their customers or of their competitors."

Judge Rose refers to the immense amount of testimony which has been taken and to the work which has been done with tireless energy by counsel on both sides. The court, he says, has spent many months in the study of the record, and he inquires, "Why should all this work be wasted?" In conclusion, he says:

"If the defendant shall hereafter do anything which will justify or require the action of the court, there would seem to be no reason why the government should not promptly get relief to which it would then be entitled, at little cost to anybody. That result can be easily obtained if a start may then be made from where we now are, which would be impossible if proceedings have to be begun all over again. A dislike for useless waste and destruction makes one loth to follow the authority which may be understood as requiring the breaking up of defendant's organization, in spite of its proved power for good, albeit with serious possibilities of evil. A like instinct rebels against taking any course which may hereafter involve this or any other tribunal going again over any part of the ground which in this proceeding has once been covered.

"Under the circumstances, would it not be better simply to retain the bill, without at present decreeing a dissolution, but reserving the right to do so whenever, if ever, it shall be made to appear to the court that the size and power of the defendant, brought about as they originally were, are being used to the injury of the public, or whenever such size and power, without being intentionally so used, have given to the defendant a dominance and control over the industry or some portion of it, so great as to make dissolution or other restraining decree of the court expedient? It is of course not suggested that this court should or could undertake the regulation of defendant's business. Courts have no such power and no fitness for its exercise. What is proposed is, in default of a better way, a means of dealing with a somewhat unusual and very difficult condition. It is to be hoped that before any oc-

"A Premature Harvesting of Monopolistic Fruit"

Summing up the evidence as to the legal situation in the defendant's early years, the court says:

"Such is the history as the record discloses it, of the genesis of the defendant, such the story of its organization and of its conduct during the first years of its existence. It is clear an attempt was made both to restrain and monopolize the interstate trade in tin cans. Trade was restrained. For a moment a substantial monopoly was obtained, and in many sections of the country, long maintained. So far as one can judge, it might have been held almost or quite everywhere had not the very determination to make it ostensibly perfect at the start combined with the reward which the promoters felt they were entitled to take at the beginning, compelled it to attempt a premature harvesting of the monopolistic fruit. Upon such state of facts had the government then asked for a dissolution of the defendant, it is difficult to see how the demand could have been refused. No matter what view might have been taken on any of the questions now still open to dispute as to the construction or application of the anti-trust act, there was a restraint of competition and an attempt to monopolize, which so far from being merely incidental to any legitimate purpose, had themselves put obstacles, and unnecessary obstacles at that, in the way of attaining the benefits which larger capital, better organization and more efficient business methods might have naturally brought about."

casion to act upon the power reserved shall arise, congress will substitute some other method than dissolution for dealing with the problems which arise when a single corporation absorbs a large part of the country's productive capacity in any one line.

"I shall take the course indicated unless one or the other of the parties insist on my entering such a final decree as will enable them to seek at once a review by a higher tribunal. If either of them does, I am not prepared now to say that they will not be within their rights, and that it will not be my duty to do what they ask. That question is reserved until the occasion for deciding it shall arise."

"Guilty, But Not Sentenced"

Washington, Feb. 28.—Of the government attorneys who appeared in the American Can Co. case, William T. Chantland, special assistant attorney, was in constant charge of the hearings, and was assisted by Henry E. Colton. George Carroll Todd, assistant to the attorney general, made an argument for the government.

Mr. Chantland, speaking to *The Iron Trade Review* about the decision, said:

"The opinion may be regarded as a finding of guilty under the law with sentence suspended during good behavior. As an analysis of facts, the opinion is the most marvelous I have ever listened to or read. It was plainly the result of the most arduous, painstaking and honest labor on the part of Judge Rose. If all judges went to the bottom of their important cases as he did in this case, there could never have arisen the criticism to which the federal judiciary has sometimes been subjected.

His findings sustain the government's allegations fully on practically every substantial point. He finds that, not only was the can company illegally organized, but that it committed acts which are clearly in restraint of trade —bought up competitors and concealed their identity, using them as the judge said, 'like the fighting ships in the Hamburg-American case'— and the opinion also finds that the can company has controlled or dominated can prices, particularly in packers' cans, during its entire existence."

Walter-Wallingford & Co., Cincinnati, have removed their Pittsburgh office from the Farmers' Bank building to 634 Oliver building. George A. Wilson is in charge.

Many Applications

Already Received for Space at Foundry Exhibit in Cleveland

C. E. Hoyt, of Chicago, formerly secretary of the Exhibition Co., has been appointed manager of the exhibit of foundry equipment and supplies, which will be conducted under the auspices of the American Foundrymen's Association and the American Institute of Metals, concurrent with the conventions of these two organizations at Cleveland, during the week of Sept. 11. Mr. Hoyt has had a wide experience in exhibition work, having had an active part in the conduct of foundry shows at Cincinnati, Detroit, Pittsburgh, Buffalo and Chicago.

The exhibit will be in charge of a committee of eight, composed jointly of representatives of the American Foundrymen's Association and the exhibitors. This committee is constituted as follows: R. A. Bull, chairman, president, the American Foundrymen's Association, Commonwealth Steel Co., Granite City, Ill.; Major Jos. T. Speer, past president of the American Foundrymen's Association, Pittsburgh Valve Foundry & Construction Co., Pittsburgh; Alfred E. Howell, past president of the American Foundrymen's Association, Phillips & Buttorff Mfg. Co., Nashville, Tenn.; J. P. Pero, senior vice president, the American Foundrymen's Association, Missouri Malleable Iron Co., East St. Louis, Ill.; A. O. Backert, secretary of the American Foundrymen's Association, Cleveland; S. T. Johnston, S. Obermayer Co., Chicago; V. E. Minich, Sand Mixing Machine Co., New York City, and H. S. Covey, Cleveland Pneumatic Tool Co., Cleveland.

The exhibition will be held at the Cleveland Coliseum, which has an available floor space, on one level, of 60,000 square feet, which is located within one block of the Hotel Statler where the meetings of the American Foundrymen's Association and the American Institute of Metals will be held. It has been decided to charge the same prices for floor space as have prevailed heretofore. Although no floor plan of the building has yet been prepared, a large number of applications for space already have been received and the indications are that the Coliseum will be inadequate to provide for all of the exhibits, necessitating the erection of a temporary building on an adjoining lot.

Saved by Ceiling.—How an investment of approximately $200 for the installation of a steel ceiling prevented a loss of from $100,000 to $200,000 has come to light through E. C. Kinsel, proprietor of a drug store in Detroit.

The Kinsel property was burned recently and the insurance adjusters have now pointed out that the fire was checked and was preventted from going through the entire building, which is one of the principal downtown corners, because of this ceiling which was installed a few months ago.

Ohio's Safety Code

The safety first movement which was started a few years ago, will probably have a material effect upon the laws governing hazardous occupations in Ohio and Massachusetts if proposed new codes of rules are adopted. Ohio's new code of rules for the protection of workmen in steel mills, blast furnaces, and iron, steel, brass and aluminum foundries has been submitted to the state industrial commission for adoption. The rules are the result of a harmonious effort of employers and labor and state officials to obtain the greatest degree of safety for workmen in hazardous occupations. The remarkable low cost of preparation is a matter of interest.

Along similar lines, the foundry committee of the Massachusetts state board of labor and industries has submitted a report on the sanitary rules and regulation for foundries.

Victor T. Noonan, safety director for the Ohio industrial commission, effectively engaged the co-operative efforts of representatives of labor and employer in the voluntary work of formulating the Ohio rules. The total expense was less than $5,000. It is said that similar codes cost $300,000 in New York state and $200,000 in Pennsylvania.

In spite of the fact that the proposed code, when adopted, will require expensive changes in many establishments, employers in general have indicated their willingness to accept the new conditions because they believe the movement is for the common good. The major portion of the work was in the hands of two committees. The general safety advisory committee was composed of Samuel P. Bush, Columbus; R. H. Jeffrey, Columbus; D. R. Kennedy, Akron, O.; F. M. Baggs, Portsmouth; Malcolm Jennings, Columbus; L. H. Burnett, Pittsburgh; Samuel G. McMeen, Columbus; John Voll, Zanesville; W. E. Wells, East Liverpool, and Victor T. Noonan, safety director.

Plan Extensions

To be Made at Bethlehem Steel Corporation Plants

New York, Feb. 29.—Extensive improvements are to be made by the Bethlehem Steel Corporation to the plants of the Maryland Steel Co., at Sparrows Point, Md., and of the Pennsylvania Steel Co., at Steelton and Lebanon, Pa., acquired by the former corporation, but the exact nature of these has not yet been officially announced. It is expected that large expenditures will be made especially to the plant of the Maryland Steel Co., with the idea of diversifying to a greater extent its output of rolled products which at present is confined to rails and billets. The ship yard capacity of the Maryland Steel Co. also will be materially extended. President E. G. Grace, of the Bethlehem Steel Corporation, made a general announcement of these intentions while on a tour of inspection of the plants of the Maryland Steel Co. and of the Pennsylvania Steel Co. during the past week. He stated that it is only a matter of a few months when all the supplies of iron ore of the Bethlehem Corporation would be received at Sparrows Point.

Upon his return to South Bethlehem, President Grace gave out a statement covering the company's plans for new extensions as they will affect the South Bethlehem plant. Mr. Grace said:

"We have just completed our inspection trip of the properties and are favorably impressed with our new acquisitions. We have noticed the papers quoting us as saying that instead of making certain contemplated improvements at Bethlehem, these would be transferred to the Maryland plant, just outside of Baltimore. It is quite possible that certain additional lines which we had planned ultimately to place at South Bethlehem may go either to Maryland or Steelton, but, if so, other lines will take their place in our development at South Bethlehem.

"In the upbuilding of the other two properties, we may find that it will be more advantageous to place certain products at Maryland and Steelton, while other lines will be better located at South Bethlehem, but we wish to say that in building up the new properties, it will in no way lessen the importance of the Bethlehem plant.

Will Build Addition.—Stockholders of the J. E. Bolles Iron & Wire Co., of Detroit, have authorized the directors to proceed with the erection of an addition to the plant. This will enable the company to employ about 75 more men. The building is to be a 4-story, reinforced concrete, fireproof structure, 45 x 130 feet, and will adjoin the present factory.

Personals

B. Nicol, of B. Nicol & Co., New York City, is taking a sojourn in the south.

Morgan B. Brainard has been made a director of the Underwood Typewriter Co. to fill a vacancy.

L. B. Anderson, secretary of the Advance Pump & Compressor Co., of Battle Creek, Mich., has been elected president of the city's board of commerce.

Following the retirement of W. F. McKenzie as vice president of the Gary Screw & Bolt Co. to become sales manager of the Buffalo Bolt Co., Buffalo, N. Y., the management of the Chicago plant will be transferred to the Pittsburgh office. J. P. Hoelzel and C. R. Ferguson have been made vice presidents in charge of sales and operations, respectively. Philip Robinson will be in charge of the Chicago office.

Robert C. Barton, district sales manager for the Western Reserve Steel Co. at Chicago, has been transferred to the main office at Warren, Ohio. He will travel from the home office as special representative on high grade sheets. He will be succeeded by George E. Thomas, who has been in charge of the Minneapolis office of the Rank & Goodell Co.

Edwin E. Slick, who has been general manager and a vice president of the Cambria Steel Co., will continue in that capacity under control of the company by the Midvale Steel & Ordnance Co. John C. Neale, who is general manager of sales of the Midvale Steel Co. and of Worth Bros., subsidiaries of the Midvale Steel & Ordnance Co., is expected also to have general supervision over the sales of the Cambria Steel Co. A. C. Dinkey now is serving as president of the Cambria Steel Co., vice W. H. Donner, resigned. This is in line with the policy of having Mr. Dinkey act as president of all the operating companies of the Midvale Corporation. Messrs. Powell Stackhouse, Herbert F. Black and Mr. Slick of the old Cambria Steel board, have continued as directors and the new members are W. P. Barba, Mr. Neale, S. M. Vauclain, Mr. Dinkey, W. B. Dickson and W. E. Corey. They succeed Alex. P. Robinson, Arthur E. Newbold and J. Leonard Replogle.

Success of the American Crucible

The crucible manufacturers have been put to sore straights for the past 18 months in the securing of their raw materials.

First came the embargo on Ceylon plumbago (this being lifted after a few months) which left the market in a depleted condition. The natural result was a tremendous advance in price.

Next came the exhaustion of the foreign clay, which is used in crucible making as a binder. The clay used, as far back as crucible history in this country goes, has come from the little principality of Klingenburg in the Black Forest in Bavaria, where, so the story goes, the entire government expenses are paid out of the export duties collected from the clays shipped out. This Klingenburg clay for years past, has been the only clay the crucible makers seemed to think they could satisfactorily use. No shipments of this clay have been made since the beginning of 1915.

Some makers have husbanded the large supplies of the foreign clay which they had on hand when hostilities started. The husbanding the stock of the now almost priceless raw material has been done by partially substituting clays from various parts of the United States and mixing with the Klingenburg clay.

The tests and trials made by the crucible makers during the past 12 months have been almost endless. When one takes into consideration that it takes from six to 10 weeks to prepare a graphite crucible for service in the foundry, some slight idea can be formed of what the crucible maker has to contend with. Added to this delay, and before he can even start in on these goods that will not be marketable for two months to come, the chemists' laboratory tests and trials must be made. These have run into the thousands. Then must come the practical tests in a small way in the foundry; for the crucible maker would stare bankruptcy in the face if he continued making up hundreds of thousands of dollars worth of goods out of Ceylon plumbago, costing from 17½ to 25 cents per pound, only to find at the end of two or three months that they might not be of service to the user.

The bright side, however, to all that, is that in many cases the crucibles made with American clays have gone a surprisingly long time in the fires. In one case there is a report on a No. 300 crucible which ran 40 heats on manganese bronze.

casion to act upon the power reserved shall arise, congress will substitute some other method than dissolution for dealing with the problems which arise when a single corporation absorbs a large part of the country's productive capacity in any one line.

"I shall take the course indicated unless one or the other of the parties insist on my entering such a final decree as will enable them to seek at once a review by a higher tribunal. If either of them does, I am not prepared now to say that they will not be within their rights, and that it will not be my duty to do what they ask. That question is reserved until the occasion for deciding it shall arise."

"Guilty, But Not Sentenced"

Washington, Feb. 28.—Of the government attorneys who appeared in the American Can Co. case, William T. Chantland, special assistant attorney, was in constant charge of the hearings, and was assisted by Henry E. Colton. George Carroll Todd, assistant to the attorney general, made an argument for the government.

Mr. Chantland, speaking to *The Iron Trade Review* about the decision, said:

"The opinion may be regarded as a finding of guilty under the law with sentence suspended during good behavior. As an analysis of facts, the opinion is the most marvelous I have ever listened to or read. It was plainly the result of the most arduous, painstaking and honest labor on the part of Judge Rose. If all judges went to the bottom of their important cases as he did in this case, there could never have arisen the criticism to which the federal judiciary has sometimes been subjected.

His findings sustain the government's allegations fully on practically every substantial point. He finds that, not only was the can company illegally organized, but that it committed acts which are clearly in restraint of trade —bought up competitors and concealed their identity, using them as the judge said, 'like the fighting ships in the Hamburg-American case'— and the opinion also finds that the can company has controlled or dominated can prices, particularly in packers' cans, during its entire existence."

Walter-Wallingford & Co., Cincinnati, have removed their Pittsburgh office from the Farmers' Bank building to 634 Oliver building. George A. Wilson is in charge.

Many Applications

Already Received for Space at Foundry Exhibit in Cleveland

C. E. Hoyt, of Chicago, formerly secretary of the Exhibition Co., has been appointed manager of the exhibit of foundry equipment and supplies, which will be conducted under the auspices of the American Foundrymen's Association and the American Institute of Metals, concurrent with the conventions of these two organizations at Cleveland, during the week of Sept. 11. Mr. Hoyt has had a wide experience in exhibition work, having had an active part in the conduct of foundry shows at Cincinnati, Detroit, Pittsburgh, Buffalo and Chicago.

The exhibit will be in charge of a committee of eight, composed jointly of representatives of the American Foundrymen's Association and the exhibitors. This committee is constituted as follows: R. A. Bull, chairman, president, the American Foundrymen's Association, Commonwealth Steel Co., Granite City, Ill.; Major Jos. T. Speer, past president of the American Foundrymen's Association, Pittsburgh Valve Foundry & Construction Co., Pittsburgh; Alfred E. Howell, past president of the American Foundrymen's Association, Phillips & Buttorff Mfg. Co., Nashville, Tenn.; J. P. Pero, senior vice president, the American Foundrymen's Association, Missouri Malleable Iron Co., East St. Louis, Ill.; A. O. Backert, secretary of the American Foundrymen's Association, Cleveland; S. T. Johnston, S. Obermayer Co., Chicago; V. E. Minich, Sand Mixing Machine Co., New York City, and H. S. Covey, Cleveland Pneumatic Tool Co., Cleveland.

The exhibition will be held at the Cleveland Coliseum, which has an available floor space, on one level, of 60,000 square feet, which is located within one block of the Hotel Statler where the meetings of the American Foundrymen's Association and the American Institute of Metals will be held. It has been decided to charge the same prices for floor space as have prevailed heretofore. Although no floor plan of the building has yet been prepared, a large number of applications for space already have been received and the indications are that the Coliseum will be inadequate to provide for all of the exhibits, necessitating the erection of a temporary building on an adjoining lot.

Saved by Ceiling.—How an investment of approximately $200 for the installation of a steel ceiling prevented a loss of from $100,000 to $200,000 has come to light through E. C. Kinsel, proprietor of a drug store in Detroit.

The Kinsel property was burned recently and the insurance adjusters have now pointed out that the fire was checked and was preventted from going through the entire building, which is one of the principal downtown corners, because of this ceiling which was installed a few months ago.

Ohio's Safety Code

The safety first movement which was started a few years ago, will probably have a material effect upon the laws governing hazardous occupations in Ohio and Massachusetts if proposed new codes of rules are adopted. Ohio's new code of rules for the protection of workmen in steel mills, blast furnaces, and iron, steel, brass and aluminum foundries has been submitted to the state industrial commission for adoption. The rules are the result of a harmonious effort of employers and labor and state officials to obtain the greatest degree of safety for workmen in hazardous occupations. The remarkable low cost of preparation is a matter of interest.

Along similar lines, the foundry committee of the Massachusetts state board of labor and industries has submitted a report on the sanitary rules and regulation for foundries.

Victor T. Noonan, safety director for the Ohio industrial commission, effectively engaged the co-operative efforts of representatives of labor and employer in the voluntary work of formulating the Ohio rules. The total expense was less than $5,000. It is said that similar codes cost $300,000 in New York state and $200,000 in Pennsylvania.

In spite of the fact that the proposed code, when adopted, will require expensive changes in many establishments, employers in general have indicated their willingness to accept the new conditions because they believe the movement is for the common good. The major portion of the work was in the hands of two committees. The general safety advisory committee was composed of Samuel P. Bush, Columbus; R. H. Jeffrey, Columbus; D. R. Kennedy, Akron, O.; F. M. Baggs, Portsmouth; Malcolm Jennings, Columbus; L. H. Burnett, Pittsburgh; Samuel G. McMeen, Columbus; John Voll, Zanesville; W. E. Wells, East Liverpool, and Victor T. Noonan, safety director.

Plan Extensions

To be Made at Bethlehem Steel Corporation Plants

New York, Feb. 29.—Extensive improvements are to be made by the Bethlehem Steel Corporation to the plants of the Maryland Steel Co., at Sparrows Point, Md., and of the Pennsylvania Steel Co., at Steelton and Lebanon, Pa., acquired by the former corporation, but the exact nature of these has not yet been officially announced. It is expected that large expenditures will be made especially to the plant of the Maryland Steel Co., with the idea of diversifying to a greater extent its output of rolled products which at present is confined to rails and billets. The ship yard capacity of the Maryland Steel Co. also will be materially extended. President E. G. Grace, of the Bethlehem Steel Corporation, made a general announcement of these intentions while on a tour of inspection of the plants of the Maryland Steel Co. and of the Pennsylvania Steel Co. during the past week. He stated that it is only a matter of a few months when all the supplies of iron ore of the Bethlehem Corporation would be received at Sparrows Point.

Upon his return to South Bethlehem, President Grace gave out a statement covering the company's plans for new extensions as they will affect the South Bethlehem plant. Mr. Grace said:

"We have just completed our inspection trip of the properties and are favorably impressed with our new acquisitions. We have noticed the papers quoting us as saying that instead of making certain contemplated improvements at Bethlehem, these would be transferred to the Maryland plant, just outside of Baltimore. It is quite possible that certain additional lines which we had planned ultimately to place at South Bethlehem may go either to Maryland or Steelton, but, if so, other lines will take their place in our development at South Bethlehem.

"In the upbuilding of the other two properties, we may find that it will be more advantageous to place certain products at Maryland and Steelton, while other lines will be better located at South Bethlehem, but we wish to say that in building up the new properties, it will in no way lessen the importance of the Bethlehem plant.

Will Build Addition.—Stockholders of the J. E. Bolles Iron & Wire Co., of Detroit, have authorized the directors to proceed with the erection of an addition to the plant. This will enable the company to employ about 75 more men. The building is to be a 4-story, reinforced concrete, fireproof structure, 45 x 130 feet, and will adjoin the present factory.

Personals

B. Nicol, of B. Nicol & Co., New York City, is taking a sojourn in the south.

Morgan B. Brainard has been made a director of the Underwood Typewriter Co. to fill a vacancy.

L. B. Anderson, secretary of the Advance Pump & Compressor Co., of Battle Creek, Mich., has been elected president of the city's board of commerce.

Following the retirement of W. F. McKenzie as vice president of the Gary Screw & Bolt Co. to become sales manager of the Buffalo Bolt Co., Buffalo, N. Y., the management of the Chicago plant will be transferred to the Pittsburgh office. J. P. Hoelzel and C. R. Ferguson have been made vice presidents in charge of sales and operations, respectively. Philip Robinson will be in charge of the Chicago office.

Robert C. Barton, district sales manager for the Western Reserve Steel Co. at Chicago, has been transferred to the main office at Warren, Ohio. He will travel from the home office as special representative on high grade sheets. He will be succeeded by George E. Thomas, who has been in charge of the Minneapolis office of the Rank & Goodell Co.

Edwin E. Slick, who has been general manager and a vice president of the Cambria Steel Co., will continue in that capacity under control of the company by the Midvale Steel & Ordnance Co. John C. Neale, who is general manager of sales of the Midvale Steel Co. and of Worth Bros., subsidiaries of the Midvale Steel & Ordnance Co., is expected also to have general supervision over the sales of the Cambria Steel Co. A. C. Dinkey now is serving as president of the Cambria Steel Co., vice W. H. Donner, resigned. This is in line with the policy of having Mr. Dinkey act as president of all the operating companies of the Midvale Corporation. Messrs. Powell Stackhouse, Herbert F. Black and Mr. Slick of the old Cambria Steel board, have continued as directors and the new members are W. P. Barba, Mr. Neale, S. M. Vauclain, Mr. Dinkey, W. B. Dickson and W. E. Corey. They succeed Alex. P. Robinson, Arthur E. Newbold and J. Leonard Replogle.

Success of the American Crucible

The crucible manufacturers have been put to sore straights for the past 18 months in the securing of their raw materials.

First came the embargo on Ceylon plumbago (this being lifted after a few months) which left the market in a depleted condition. The natural result was a tremendous advance in price.

Next came the exhaustion of the foreign clay, which is used in crucible making as a binder. The clay used, as far back as crucible history in this country goes, has come from the little principality of Klingenburg in the Black Forest in Bavaria, where, so the story goes, the entire government expenses are paid out of the export duties collected from the clays shipped out. This Klingenburg clay for years past, has been the only clay the crucible makers seemed to think they could satisfactorily use. No shipments of this clay have been made since the beginning of 1915.

Some makers have husbanded the large supplies of the foreign clay which they had on hand when hostilities started. The husbanding the stock of the now almost priceless raw material has been done by partially substituting clays from various parts of the United States and mixing with the Klingenburg clay.

The tests and trials made by the crucible makers during the past 12 months have been almost endless. When one takes into consideration that it takes from six to 10 weeks to prepare a graphite crucible for service in the foundry, some slight idea can be formed of what the crucible maker has to contend with. Added to this delay, and before he can even start in on these goods that will not be marketable for two months to come, the chemists' laboratory tests and trials must be made. These have run into the thousands. Then must come the practical tests in a small way in the foundry; for the crucible maker would stare bankruptcy in the face if he continued making up hundreds of thousands of dollars worth of goods out of Ceylon plumbago, costing from 17½ to 25 cents per pound, only to find at the end of two or three months that they might not be of service to the user.

The bright side, however, to all that, is that in many cases the crucibles made with American clays have gone a surprisingly long time in the fires. In one case there is a report on a No. 300 crucible which ran 40 heats on manganese bronze.

War Orders Are of Less Importance

A Brisk Demand From Domestic Sources Overshadows Foreign Buying —Some Tool Orders Placed for 1917 Delivery

LEADING machine tool houses in the east report a rather brisk demand from domestic sources. Makers of automobiles and automobile accessories have been good buyers during the past week and satisfactory orders have been received from most other lines of industry. Further fair-sized purchases have been made by some of the domestic war munition manufacturers, who continue eager to purchase certain kinds of tools for early delivery. Practically all of the business now current involves small orders and no important transactions are reported. Occasional sales of machine tools for delivery early in 1917 are reported, but, as a rule, the demand is for the earliest shipment obtainable. Export business continues to be reported, but this is of a scattered character and does not compare in volume with that prevailing a few months ago. The inquiries for 36-inch and other large-swing lathes, for making 9.2-inch and 12-inch shells on new contracts under negotiation, still are pending. No new railroad inquiries have come out, but some good orders for machine tools have been placed by the Southern Pacific railroad.

The Braden Copper Co. and the Chile Exploration Co., 120 Broadway, New York, have important negotiations under way for purchasing equipment for the development of their properties in South America. Included in the requirements are a number of locomotive cranes. The Anaconda Copper Mining Co. recently bought several locomotive cranes. It is expected that inquiries for locomotive cranes soon will be issued by the French Railways commission, Paris, and by the city of Rouen, France.

Extensions to capacity are being made at the plants of the following eastern companies: Underwood Typewriter Co., Hartford, Conn.; Art Metal Works, Newark, N. J.; J. H. Smith Co., Buffalo; Colt's Patent Fire Arms Co., Hartford, Conn.; Baltimore Dry Dock & Ship Building Co., Baltimore; Maryland Metal Cross-Tie Co., Baltimore; Buffalo Pattern Works, Buffalo; Wicaco Screw & Machine Co., Philadelphia; Hess-Bright Mfg. Co., Philadelphia; Campbell Electric Co., Lynn, Mass.; Scovill Mfg. Co., Waterbury, Conn.; Baltimore Tube Co., Baltimore; Philadelphia Textile Machinery Co., Philadelphia; Baldwin Locomotive Works, Philadelphia, and others.

Chicago Settles into Steady Stride

BUSINESS in the machine tool trade at Chicago apparently has settled to a steady current, devoid of the large inquiries and spasmodic buying which characterized it for several months. Both domestic and foreign sales are strong, but less rigid delivery clauses are being placed and buyers appear willing to wait for the builders. Buyers also seem less inclined to take second hand tools, although a number of such machines are being sold. An inquiry has just been received in this market for 74 24-inch engine lathes, of which 54 are to be equipped with taper attachments. These are desired by the Italian government. Another foreign industry is from a buyer acting as agent for the Russian government and calls for 25 hand screw machines to handle stock from 5/8 to 1¼ inches. Another inquiry recently current calls for 100 screw machines to handle material from 1 to 2 inches. The Illinois Steel Co. has inquired for a number of tools, including several lathes, a radial drill and other equipment for its South Works. The Chicago & North-Western railroad recently bought a belt-driven power hammer.

Cleveland Market Steady But Quiet

THE machine tool market in Cleveland is actively engaged in the second hand business for the time being. New machines are not obtainable and second hand material is being eagerly sought. There are a few inquiries of fair proportions pending but negotiations usually are halted by the early delivery clause. It has been announced through a local tool dealer that a Cincinnati builder has refused all future business, prices and deliveries until the present orders have been cared for. No orders will be acknowledged or new business taken in its name, it is said, until further notice.

Woodworking Machines Moving

PITTSBURGH machine tool dealers, for the first time in many months, are literally besieged with inquiries for woodworking machinery of all kinds. The revival in buying of band saws, jointers, planers and pattern shop equipment began two weeks ago and has been gaining in momentum the last few days. Inquiries have come out for 100 18-inch lathes, 100 20-inch lathes and 77 24-inch lathes for export. Some dealers have quoted on a few of the machines involved, not being able to furnish more than a small part of the total number wanted. All lines of machines for domestic manufacture are moving rapidly. The Pittsburgh Model Engine Co., Pittsburgh, has withdrawn from the market as an active buyer, after having purchased about 125 tools.

Cincinnati Demand Slackens

A SUDDEN slackening in inquiries for machine tools has been evident during the past week. This decrease is caused by the fact that immediate shipments cannot be be made by shops in that city. Orders running well into the second half of the year prohibit early shipment. This lull, however, is believed to be only temporary, and the usual overflow of inquiries for all kinds of machine tools is expected shortly. Builders of small tools and machine tool parts are rushed and are operating day and night. Demand for portable and bench drills and grinders is very heavy, and is far above the capacity of the builders. A number of shops are enlarging their facilities materially. Among these are the Cisco Machine Tool Co., the Boye & Emmes Machine Tool Co. and the Cincinnati Gear Co.

Stripping the Ingots

Our facilities for stripping the ingots preparatory to putting them in the soaking pit, are most excellent.

Notice the illustration—especially the huge, up-to-the-minute 100-ton Morgan Ingot Stripper Crane.

We have an immense number of ingot molds of all sizes which keep our Ingot Stripper busy.

Our entire organization is so capable, and our equipment so efficient and complete, that "AGATHON" QUALITY AND SERVICE ARE IN GREAT DEMAND.

AGATHON STEELS

"AGATHON" Chrome Nickel
"AGATHON" Chrome Steel
"AGATHON" Chrome Vanadium
"AGATHON" Nickel Steel
"AGATHON" Special Analyses
"AGATHON" Vanadium
"AGATHON" Silico-Manganese
"AGATHON" High Carbon

THE CENTRAL STEEL COMPANY

MASSILLON, OHIO

Detroit Office: 326-27-28 Ford Building, F. Walter Guibert, District Representative
Cleveland Office: Hickox Building, The Hamill-Hickox Co., District Representative

Along the Middle Atlantic Seaboard

BROOKLYN, N. Y. — Frank H. Quinby, architect, 99 Nassau street, New York, is drawing plans for a 4-story addition to the factory of E. D. Jordan, 129 Degraw street, Brooklyn.

BROOKLYN. N. Y.—The Scientific Machine & Tool Corporation has been incorporated to build machinery, supplies, engineering appliances and to carry on business as consulting engineer; $5,000 capital stock; by G. D. Siff, S. B. Beliaeff, T. Evertson, 437 Pulaski street, Brooklyn.

BUFFALO.—The J. H. Smith Co., manufacturer of gas fixtures, has let a contract to the Turner Construction Co. for the erection of a 3-story factory to cost $20,000.

BUFFALO. — The Buffalo Pattern Works has rejected all bids for the construction of a 2-story, 70 x 120-foot factory, and it is likely that the plans will be revised.

BUFFALO. — Howard L. Beck, architect, Municipal building, has completed plans and specifications for a 3-story and basement, 60 x 190-foot garbage disposal plant to be erected for the city of Buffalo.

BUFFALO. — The Buffalo Pressed Steel Co. has been incorporated; $30,000 capital stock; by D. H. Stoll, R. J. Mackenzie and K. B. MacDonald, to manufacture iron, steel, aluminum, copper and brass products.

FLUSHING, L. I.—The Long Island Machinery Co. has been incorporated to build machinery and tools; capital stock no par value; by C. F. Simmons, J. M. Gilbert, G. L. Seabury, 98 Wilson avenue, Flushing.

HOLLIS, N. Y.—The Standard Motor Construction Co. of New York, has been incorporated to build stationary and marine engines; capital stock no par value; L. Kaufman, S. M. Kohn and M. Simis, Hilburn street, Hollis.

LONG ISLAND CITY, L. I. — Wm. M. Brodie and Chas. Tatham, New York, have leased a plot on Tenth and Vernon avenues, on which they will erect a factory for the manufacture of metallurgical supplies.

NEW YORK.—The Chile Exploration Co., 120 Broadway, is in the market for locomotove cranes to be shipped to Chile.

NEW YORK.—The Braden Copper Co., 120 Broadway, is in the market for locomotive cranes to be used in developing the company's Chilean properties.

NEW YORK. — The Reeps Mfg. Co. has been incorporated to build motor vehicles, accessories, etc.; $25,000 capital stock; by E. Scott, C. S. Schuman, B. J. Aplin, 557 West 140th street.

NEW YORK.—R. Fabien & Co., exporters, 35 South William street, are in the market for two second-hand foundry cranes for export, each to have 45-foot span, one with capacity of five tons and the other 10 or 15 tons.

NEW YORK. — The Yorkville Electrical Appliance Co. has been incorporated to manufacture gas and electrical fixtures and supplies; $10,000 capital stock; by R. Hoffman, H. P. Karlindecker and J. Hochman, 322 East Eighty-first street.

NEW YORK.—The Arrow Motor & Machine Co. has been incorporated to build engines, boilers, foundry and factory supplies, etc.; $100,000 capital stock; by M. E. Skerritt, G. H. Timmerman and L. Weiscopf, Hotel McAlpin.

NEW YORK. — The Garfield Chemical & Mfg. Co. has been incorporated to manufacture sulphuric acid and its products, fertilizers, etc.; $500,000 capital stock; by C. W. Whitley, E. L. Newhouse and B. D. Isman, 622 West 113th street.

NEW YORK. — It is expected that inquiries shortly will be received in New York from the municipal government at Rouen, France, for a number of locomotive cranes and other equipment, which will be installed to improve the handling facilities at the city docks of Rouen.

SYRACUSE, N. Y.—The Will & Baumer Co. has let a contract for the erection of a 1-story, 25 x 90-foot factory addition.

SYRACUSE, N. Y. — Semet-Solvay Co.'s plant was damaged by fire caused by an explosion.

CAMDEN, N. J.—Bids will be opened soon for the construction of the Camden high school, which will cost $500,000. Paul A. Davis, of 1713 Samson street, Philadelphia, is the architect. A machine shop, forge room, foundry, boiler and power rooms will be added to the school.

DOVER, N. J.—New Jersey Light & Power Co. has purchased a 10-acre plot adjoining the Central Railroad of New Jersey tracks from the Ulster Iron works. The company intends to erect a $200,000 plant on the plot. W. S. Barstow, president of the company, says the concern is acquiring all the power plants in Sussex county as well as the machinery of the power plant at Boonton. Mr. Barstow was formerly second vice president of the Sandusky Gas & Electric Co., Sandusky, O. The order for the machinery for the new plant was placed a short time ago.

ELIZABETH, N. J.—The Barrett Mfg. Co. has taken out a permit for the erection of a storage house to cost $6,600.

IRVINGTON, N. J.—The Copeley Mfg. Co. has been incorporated to manufacture metal goods; $25,000 capital stock; by William H. Peck, Glen Ridge, Herman Crowe, Emerson and John W. Crandall, New York.

JERSEY CITY, N. J.—The Public Service Corporation of New Jersey, with main offices at Newark, expects to build a 95 x 100-foot substation addition in Jersey City.

JERSEY CITY, N. J.—The General Laboratory Works has been incorporated to manufacture chemicals, dyes and colorings; $5,000 capital stock; by Atwood C. Wolff, Eric Jentz and Frank J. V. Ginnino, all of Jersey City.

LINCOLN, N. J. — The plant of the Middlesex Aniline Chemical Co. was damaged by an explosion. The plant will be rebuilt.

NEWARK, N. J. — The Newark Spring Mattress Co, has let a contract for the erection of a 1-story, 34 x 85-foot steel foundry.

NEWARK, N. J.—The Art Metal Works, Mulberry and Center streets, has let a contract for the erection of an addition.

NEWARK, N. J.—The Butterworth-Judson Co. has contracted for the erection of a 1-story addition to be used as a factory building. The structure will cost $6,000.

NEWARK, N. J. — Willard Case & Co., architects, 17 Battery place, New York, are drawing plans for a factory addition and a power house to be erected for the Duratex Co., Newark.

NEW PROVIDENCE, N. J.—The Essex Specialty Co., whose plant was recently damaged by fire, will rebuild shortly.

PATERSON, N. J.—For the development of a manufacturing center, the Paterson chamber of commerce has purchased considerable property adjoining the Erie railroad at Paterson. This land will be utilized to help fill the demands for mill space. A 4-story, 60 x 300-foot building will be erected at once and others will be built at a later date.

PERTH AMBOY, N. J.—The C. Pardee Works is planning several additions. These include a new nut factory and smaller structures; a monorail system and an additional furnace will be installed.

PERTH AMBOY, N. J.—The Raritan Copper works will build a 1-story addition to the powerhouse and engine room to cost nearly $7,000. The architects are Goldberger & Greisen.

RAHWAY, N. J.—Superintendent Moore of the Rahway reformatory, in a report to the governor of New Jersey, recommends the installation of considerable additional mechanical equipment.

TRENTON, N. J.—William R. Thropp Sons Co. has purchased three lots adjoining its plant to be held for future enlargements.

Among New England Factories

BANGOR, ME.—The Great Northern Paper Co. is contemplating the erection of a ground wood pulp mill on the Mattamiscontis creek and it is expected that other projects dependent upon water power will be developed through the opening of an electric railway, promoted by Chas. W. Mullen and others of Bangor, which renders accessible the region

BOSTON.—Carter, Carter & Meigs Co. has bought 8,000 square feet at State street, Atlantic avenue and Central street and will utilize the site for a building.

CHICOPEE FALLS, MASS. — The Fiske Rubber Co. has let a contract for the erection of a 6-story, 95 x 160-foot addition.

LYNN, MASS.—The Newhall estate has let a contract for the erection of a 1-story, 60 x 70-foot shop building.

LYNN, MASS.—The Campbell Electric Co. is having plans drawn by Penn Varney, architect, 25 Exchange street, for a 6-story and basement, 58 x 110-foot building to be devoted to the manufacture of electrical supplies.

SPENCER, MASS. — Harry S. Tripp has bought the wire specialty manufacturing business of the Dean Wire Co. Spencer.

BRIDGEPORT, CONN. — The Farist Steel Co., according to an official, will rebuild its burned plant as soon as possible. On account of the heavy damages to the rolling mills and the open hearth furnaces, it is expected that several months will elapse before work is resumed. The company estimates its loss at $350,000, which is exclusive of contracts which will be delayed.

HARTFORD, CONN. — The Colt's Patent Fire Arms Mfg. Co. has let a contract for the erection of a 4-story and basement, 75 x 190-foot factory building.

Crawford Ore from the Dean-Itasca Mine on the Mesabi Range

The ore is non-bessemer, of good coarse structure. Dean-Itasca mine shipments for 1915 were 486,374 tons, mostly since August 1. For 1916 they will be considerably greater.

A complete analysis of Crawford Ore from Dean-Itasca Mine in natural state and dried at 212° Fahr.

	Dried 212°	Natural
Iron	58.35	50.2451
Phosphorus	.065	.05597
Silica	6.03	5.1924
Manganese	1.00	.8611
Alumina	3.40	2.9277
Lime	.16	.1377
Magnesia	.12	.1033
Sulphur	.031	.0266
Volatile Matter	5.74	4.9427
Moisture	13.89	

Crawford Ore Guarantee for 1916, 51.50 Per Cent Iron, Natural

The output of this mine during 1916, together with our five other mines, gives us an unusually large tonnage.

We are now taking contracts for this ore and will be glad to figure on your requirements for the coming season.

THE TOD-STAMBAUGH COMPANY

Perry-Payne Building

CLEVELAND :: :: :: :: OHIO

Activities in the Central States

BOWLING GREEN, O.—The Trolley Mfg. Co. has been incorporated; $10,000 capital stock; by Roscoe E. Seever, Arthur G. Hale, John L. Amith, Harvey A. Thrush and Robert N. Seever.

CAREY, O.—The National Traction & Plow Co. has been incorporated; $5,000 capital stock; by Alexander Carpenter, R. G. Spencer, C. C. Kissell, E. C. Edwards and C. G. Spencer, all of Carey.

CINCINNATI.—The Stacey Bros. Gas Construction Co. will build an addition to its plant in Elmwood Place, 46 x 48 feet.

CINCINNATI.—The Edgemont Machine Co. is in the market for equipment for building transmission machinery.

CINCINNATI.—The Henderson Lithographing Co. will build a 5-story addition to cost $150,000 adjoining its present plant in Norwood. No contracts have been let.

DAYTON, O. — The Oakwood Power & Light Co. will spend $15,000 for improvements to its plant.

NEW CUMBERLAND, W. VA. — The National Steel Casting Co., recently organized, has begun the erection of a plant for the manufacture of steel castings. E. E. Kramer is the president.

SOUTH CHARLESTON, W. VA.—Bids will be asked soon on the construction of a waterworks plant, to cost $30,000. Arthur Giessler, 6103 Riebold building, Dayton, O., is the engineer.

WILLIAMSON, W. VA. — The Williamson Light & Heat Co. will erect a building for the manufacture of ice. M. R. Carpenter, architect, 62 Pickering building, Cincinnati, is preparing the plans.

ANDERSON, IND.—Equipment amounting to $150,000 will be purchsed by the city of Anderson for an electric light plant.

BICKNELL, IND.—The Vandalia railroad, F. T. Hatch, St. Louis, chief engineer, will build shops and a roundhouse at Bicknell, at a cost of $350,000.

BLOOMINGTON, IND.—The city waterworks will be extended and a second pumping station constructed under the contract which has been awarded to Thomas Hardin, Olney, Ill.

FORT WAYNE, IND.—The General Electric Co. will build four additional structures at its Fort Wayne plant at a cost of $1,000,000.

INDIANAPOLIS, IND.—The National Malleable Casting Co., 546 Holmes avenue, is receiving bids on a foundry to cost $20,000.

INDIANAPOLIS, IND. — The Fairbanks-Morse Electric Mfg. Co., R. F. Fleming, manager, will build an addition to its factory, one story, 80 x 100 feet, at a cost of $10,000.

INDIANAPOLIS, IND. — The Indianapolis Cordage & Implement Co. has purchased the plant of the American Motors Realty Co. and will equip it at once. The former company was recently incorporated at $500,000.

INDIANAPOLIS, IND. — The Tone Engineering Co. has been incorporated to deal in motors and other power plant machinery; $37,500 capital stock; by Fred I. Tone, W. P. Kirk and V. I. Moncrieff.

KOKOMO, IND.—The Superior Machine & Tool Co. will build a $15,000 machine shop, 80 x 140 feet.

RICHMOND, IND. — The county engineer has prepared plans for a concrete bridge at South G street to cost $175,000.

ARGO, ILL.—Davidson & Weiss, architects, 53 West Jackson boulevard, are preparing plans for a $50,000 factory, 168 x 272 feet, at Argo, for the Elgin Motor Car Corporation, 68 West Monroe street, Chicago.

CHICAGO. — Charles Urbanek, 350 North Clark street, architect, is taking bids on a 4-story factory, 40 x 100 feet, to cost $30,000.

CHICAGO. — Charles Urbanek, 350 North Clark street, Chicago, is preparing plans for an 8 x 200-foot steel stack, for the Link-Belt Co., Thirty-ninth street and Stewart avenue.

CHICAGO. — The Fort Dearborn Foundry Co. has been incorporated; $5,000 capital stock; by Drummond D. English, William Garnett and Charles E. Fargo, 5430 Lakewood avenue.

CHICAGO.—The Chicago Mfg. & Welding Co. has been incorporated; $10,000 capital stock by Warren D. Buckley, P. L. Nelson and Walter H. Eckert, 10 South LaSalle street.

CHICAGO.—The American Blow Pipe & Ventilating Co. has been incorporated; $25,000 capital stock; by Andrew H. Anderson, Daniel Bell and Otto Butzbach, 4715 North Lawndale avenue.

CHICAGO.—The Auto Speed Recorder Co. has been incorporated; $25,000 capital stock; by Clarence P. Jeske, Charles A. Jeske and Seymour H. Dickinson, 2022 Irving Bark boulevard.

CHICAGO.—Davidson & Weiss, architects, 53 West Jackson boulevard, are preparing plans for a $200,000 plant on which bids will be taken about March 1. The name of the builder has not been divulged. This plant will include a foundry 130 x 300 feet, machine shop 130 x 320 feet, pattern shop, two stories, 76 x 92 feet, office buildings, two stories 80 x 90 feet, warehouse 80 x 100 feet, power house 40 x 80 feet and a storage shed 30 x 120 feet.

DANVILLE, ILL.—An election will be held soon to vote on $250,000 in bonds for a municipal electric light plant. W. H. Martin is the city engineer.

DECATUR, ILL.—The Wabash railroad is planning to spend $100,000 for subways.

DEPUE, ILL.—The Mineral Point Zinc Co. is constructing an oxide plant of steel and concrete and will install furnaces, ore handlers, fans and other equipment.

GOLCONDA, ILL.—The Ozark Zinc Co. of Illinois, has been incorporated; $150,000 capital stock; by Dent Reid, E. L. Klein and L. Roth.

MATTOON, ILL.—An election will be held in April on issuing $25,000 in bonds for a municipal electric light plant.

WAUKEGAN, ILL. — The county supervisors have been asked to build a bridge over the channel connecting Pistakee and Nippersink lakes, at a cost of $25,000 to $30,000. Charles Russell is county surveyor.

CLIO, MICH.—An election will be held in April on issuing $25,000 in bonds for waterworks system, W. G. Goodrich is the village clerk.

DETROIT.—The floor space in the plant of the Detroiter Motor Car Co. has been increased by the addition of 20,000 square feet.

DETROIT.—Kahn & Wilby, architects, 58 West La Fayette avenue, are preparing plans for a factory for the Michigan Stamping Co., John French, president, 759 Bellevue avenue.

DETROIT. — The Inland Metal Products Co. has been incorporated to manufacture automobile accessories; $75,000 capital stock; by Walter C. Boynton, C. Piquette Mitchel and James Swan.

DETROIT.—Leon Coquard, architect, 169 First street, is preparing plans for the Marx Brass Foundry Co. for a brass foundry and machine shop, 60 x 155 feet, on which bids will be taken in March.

FENTON, MICH.—The Walker Mfg. Co., founder and machinist, will install new machinery. The company's officers are: John Cook, president; James Bryce and Jay M. Whitney.

GRAND RAPIDS, MICH. — The Grand Rapids Steel Furnace Co. is planning an addition.

GRAND RAPIDS, MICH.—The Clipper Belt Lacer Co. has increased its capital stock from $100,000 to $200,000, to provide for plant extensions now under way.

HOLLAND, MICH.—The Superior Foundry Co. has been incorporated; $50,000 capital stock; by Albert Knooikingen, George E. Koesen and Daniel Ten Cate, all of Holland.

KALAMAZOO, MICH.—The States Motor Mfg. Co. has been organized and will begin work on the manufacture of a line of 8-cylinder and 4-cylinder cars.

DETROIT. — The Standard Motor Truck Co. will construct a 3-story addition.

LANSING, MICH.—W. K. Prudden & Co., manufacturers of automobile wheels, plan a 2-story addition, 70 x 540 feet, to cost $50,000.

LUDINGTON, MICH.—The Gile Tractor & Engine Co., W. L. Gile, manager, will build an addition to its plant.

MONROE, MICH.—The River Raisin Paper Co., George Woods, manager, will build and equip a machine shop.

MUSKEGON, MICH.—The Howe Chain Co. has been incorporated; $100,000 capital stock; by Glenn G. Howe, New York, Joseph E. Christian and Ralph J. Teeter, Muskegon.

PONTIAC, MICH.—The Columbia Truck & Trailer Co., F. G. Clarke, manager, Flanders Motor building, is having plans prepared for an automobile factory, 90 x 370 feet.

THREE RIVERS, MICH. — The Sheffield Car Co. is building an engine testing and asesmbling plant, 60 x 200 feet.

BELOIT, WIS.—The Gardner Machine Co., Beloit, Wis., manufacturing disc grinders, which is completing work on a 60 x 60-foot addition to its shops will begin at once to erect a second addition of the same size.

GREEN BAY, WIS.—The Nelson-Indra Machine Co., Green Bay, has been awarded the contract for completely equipping a planing and general woodworking mill for the Little Chute Lumber & Fuel Co., Little Chute, Wis. The contract includes power equipment, motors, joiners, ripsaws, shafting, hangers, belting, etc.

HARTFORD, WIS. — Robert A. Messmer & Bro., architect, 1004 Majestic building, Milwaukee, have been engaged by the Kissel Motor Car Co., Hartford, to design a shop and factory building, to be erected during the summer on the tract of 17 acres which the company recently purchased, as noted, adjoining its holdings. It is expected that plans will be ready about March 25.

MADISON, WIS.—The Scanlan-Morris Mfg. Co., maker of steel hospital and office furniture and surgical instruments, is building a new plant on the site where its works was damaged by fire a year ago. Two machine shops and factory buildings are being erected. The new plant will have about double the capacity of the old factory.

MADISON, WIS.—A $100,000 corporation to manufacture magnetos and other electrical devices and appliances is being organized by

Shrapnel Talks With

ROLLING MILL JIM

What kind of tonnage are you gettin on rounds?

You know them ginks needs the stuff over there and now's the time for you to give it to'em while the goin's good. Some day the last chunk of lead will be fired and they won't be pushin you so hard. Then you'll wish you'd had Hubbard Rolls so that you wouldn't of had to stop and make so many changes. Our Company's breaking the record for rolling rounds and we're doing it by gettin big runs on our rolls. I shouldn't be givin you guys all my dope as you'll get to usin Hubbard rolls and do as good as me and then my boss won't think I'm so damn much after all.

So long,

Rolling Mill Jim.—

Hubbard Steel Foundry Co.

EAST CHICAGO, IND.

All Kinds of Iron and Steel Rolls and Steel Castings.

Henry A. Ziola, inventor and electrical engineer, Madison. Mr. Ziola has been granted patents on a new type of high tension magneto for internal combustion engine ignition and production of this device will be featured by the proposed company.

MANITOWOC, WIS.—The Wisconsin Aluminum Foundry Co., Manitowoc, Wis., is preparing plans for an addition. The board of directors has authorized the enlargement, and work is expected to start about April 1. Plans are being prepared for a brick and steel structure, 74 x 145 feet, to be used for foundry and machine shop to double the present capacity. The officers are: President, Henry Stahl; vice president, David Balkansky; secretary and treasurer, Bruno Dalwig; manager, A. Schwartz.

MILWAUKEE. — Preparations are being made to start building this spring an electric railroad from Milwaukee to Fox Lake. Alvin P. Kletzsch, Milwaukee, is interested.

MILWAUKEE. — Articles of incorporation have been filed by the American Potash Production Co., of Milwaukee. The capital stock is $10,000 and the incorporators are D. A. Sondel, Carl B. Rix and W. A. Walker.

MILWAUKEE.—The Heil Co., Julius P. Heil, president and general manager, Twenty-sixth and Montana avenue, manufacturer of structural steel and sheet metal work, has increased its capital stock from $20,000 to $50,000 and will enlarge its plant.

MILWAUKEE.—A new brass foundry and machine shop will be erected by the Claus Automatic Gas Cock Co., now located at 2601 Vliet street, Milwaukee, at Keefe avenue, near Booth street. Plans are now in preparation and work will be undertaken about March 15.

MILWAUKEE. — The Worden-Allen Co., Milwaukee, has taken following highway bridge contracts in northern Wisconsin: Bear Creek, near Hurley, Wis., 70-foot span; Werden bridge, village of Mason, Bayfield county; Defer, Iron county, 45-foot span. The Wausau Iron Works, Wausau, Wis., has been awarded a bridge contract at Ashland Junction, Wis.

MILWAUKEE.—The department of public works, Milwaukee, has awarded the following contracts for water pipe, fittings and valves for the municipal waterworks system: The American Cast Iron Pipe Co., Chicago, 1,200 tons of 6-inch, 250 tons of 8-inch and 250 tons of 12-inch class C pipe; to the Nortmann-Duffke Foundry Co., Milwaukee, 75 tons of specials.

MILWAUKEE. — The Rundle-Spence Mfg. Co. has sold its automatic sprinkler system division to an eastern syndicate which now owns the Chicago Automatic Sprinkler Co., the Globe Automatic Sprinkler Co., Cincinnati, and the Merchant & Evans Co., Philadelphia. The new company will maintain offices at Philadelphia and works will be located at Wheeling, W. Va. The Rundle-Spence company will continue to manufacture its specialty.

MILWAUKEE. — The Wisconsin Iron & Wire Works, 186 East Water street, has engaged Armand D. Koch, architect, 1045 Wells building, to prepare plans for the works to be erected at Franklin and Booth streets in the spring. The building will be of brick and steel, 140 x 200 feet, constructed in four units, one and two stories high. The cost is estimated at $40,000. The project has been previously noted.

MILWAUKEE. — An electric steel foundry will be established in Milwaukee soon. The Pelton Steel Co., Milwaukee, has been incorporated with a capital stock of $100,000 by Fred Vogel Jr., William H. Schuchardt and Gustav A. Reuss, Milwaukee, and E. T. Pelton, who has been associated with the National Steel Foundries Co. Mr. Pelton will be general manager. The company will start operations about the middle of this month at Chicago avenue and Elliott place, and will run on crucible castings until the electric furnace installation is made about June 1.

OAKFIELD, WIS. — The iron works business conducted by Arno A. Ewald has been incorporated under the name of The Ewald Works. The capital stock is $20,000 and the incorporators are Arno A. Ewald, Frank E. Willard, Frank L. Cowles and Watson E. Bristol.

OSHKOSH, WIS.—N. C. Woodin and H. O. Hafemeister, Antigo, Wis., have organized the Hoist & Elevator Mfg. Co. and will establish a plant on Jackson street to build hoisting machinery.

OSHKOSH, WIS.—Loper & Loper, Oshkosh, have awarded the general contract for the erection of a new 2-story garage and machine shop, 60 x 150 feet, to C. R. Meyer & Sons Co., who have sublet the steel work to the Wisconsin Bridge & Iron Co., Milwaukee. The investment will amount to about $20,000.

RACINE, WIS.—The Ajax Auto Parts Co. has been incorporated to manufacture automobile equipment and parts; $5,000 capital stock; by F. C. Hegner, Owen McKivitt and J. J. Lochowitz.

SUPERIOR, WIS. — The county highway commissioner has awarded the contract for four bridges in Douglas county to the Wausau Iron Works, Wausau, Wis. All the bridges will have a 16-foot roadway, and will be 75, 60, 50 and 38 feet long, respectively.

TWO RIVERS, WIS.—The common council is preparing to take bids for additional equipment for the municipal waterworks pumping station, to include two high-pressure boilers and a pumping engine.

WATERTOWN, WIS. — The Motor Inn Garage and machine shop at Fifth and Main streets, Watertown, has been purchased by Fred Day Jr., John Day and Frank J. Shobolosky, Oconomowoc, Wis., who will take immediate possession. Mr. Shobolosky formerly was foreman of the machine shop of the Kissel Motor Car Co., Hartford, Wis.

WEST ALLIS, WIS. — The Kearney & Trecker Co., manufacturer of milling machines, will build a 1-story addition, 60 x 250 feet.

WEST ALLIS, WIS.—The Carter Automobile & Machinery Co., Fifty-first and National avenues, will build a machine shop, garage and factory, 72 x 124 feet. Charles L. Lesser, 599 Seventy-first street, Milwaukee, is architect.

EAST ST. LOUIS, MO.—The Commercial Acid Co. has purchased a site and will erect a plant estimated to cost about $10,000.

JEFFERSON CITY, MO.—The city of Jefferson City will build a 50,000-gallon steel tank on a steel tower, plans for which are being prepared by Chester & Fleming, Pittsburgh.

KANSAS CITY, MO.—The E. D. Tyner Construction Co. has increased its capital stock from $20,000 to $30,000.

KANSAS CITY, MO.—The Missouri Interstate Paper Co., 412 West Tenth street, has bought a site for a 6-story factory and warehouse, 70 x 142 feet.

KANSAS CITY, MO. — Waddell & Son, Kansas City, are preparing plans for a reinforced concrete bridge 100 feet long at Thirty-first street and Hammond boulevard, costing $60,000.

KANSAS CITY, MO. — Waddell & Son, Kansas City, are preparing plans for a reinforced concrete bridge over Blue river in Swope park, 750 feet long, costing $220,000. This will require 600 tons of reinforcing steel bars.

ST. JOSEPH, MO. — The Western Tablet Co., Eleventh and Mitchell streets, is preparing plans to remodel its power plant and install a 100-horsepower oil engine. F. B. Daggett, 614 North Fifth street, is the engineer.

WENTZVILLE, MO.—The American Light & Power Co., F. E. Murray, district manager, St. Louis, is considering the construction of an electric light plant at Wentzville and another at Wright City.

WINDSOR, MO. — The Windsor Light & Power Co. has been incorporated; $18,000 capital stock; by J. C. Roberts, R. F. Williams and Ruth Roberts.

BETTENDORF, IA.—The Bettendorf Co. is planning the addition of two furnaces to its foundry.

FAIRFIELD, IA. — The Louden Machinery Co. will build a 2-story factory.

MASON CITY, IA.—The Modern Brotherhood of America, T. B. Harker, chairman, Des Moines, Ia., is having plans prepared by Bell & Bentley, 518 Security building, Minneapolis, for an office building, nine stories, to cost $250,000.

NEVADA, IA. — Bids will be received shortly by F. E. King, county auditor, for 224 corrugated iron culverts, 12 x 24 inches, 114 reinforced concrete bridges and one steel bridge.

RED OAK, IA.—Bids will be received until March 9 by Peter Ostrom, county auditor, for about 4,830 lineal feet of 12 to 48-inch culverts. Bids will be taken on corrugated iron, cast iron pipe, steel pipe and reinforced concrete. C. D. Forbeck is the county engineer.

SIOUX CITY, IA.—The Chicago, St. Paul, Minneapolis & Omaha railroad, R. Rettinghouse chief engineer, St. Paul, is planning to spend $60,000 in improvements at its shops at Sioux City.

WEST BURLINGTON, IA.—The Burlington railroad has tentative plans for the enlargement of its erecting and machine shops at West Burlington. The estimated cost of construction is about $1,000,000.

DULUTH, MINN.—The Hugo Mfg. Co., 310 West Second street, is having plans prepared by Kelly & Williams, 402 First National Bank building, for a factory and office building, two stories, 50 x 180 feet, to cost $25,000.

MINNEAPOLIS.—B. W. Harris is interested in the establishment of a gas engine plant in the midway district, to cost $350,000.

ST. PAUL.—The Fosstom Mfg. Co. and the Carpenter Wing Carrier Co. have been incorporated; $300,000 capital stock; to build a factory at 473 North Carpenter street for manufacturing farm implements.

WINONA, MINN.—The Wisconsin Railway, Light & Power Co. is planning the construction of a steam reserve power plant to cost $200,000.

In the South and Around the Gulf

NORFOLK, VA.—The International Submarine Engineering Co. has been incorporated to manufacture diving apparatus and operating machinery; $300,000 capital stock; by Gerard Vernon Meakin and V. L. Parker, Law building.

QUANTICO, VA.—The Quantico Co. has been organized by Eldridge E. Jordan, president, Real Estate Trust Co., Washington, D. C., Walter J. Long and B. R. Walters, both of Quantico. The company proposes to erect a steel plant of seven units the first building of which will be 120 x 250 feet. This company will manufacture steel boilers, freight and passenger cars and similar equipment. A site is being surveyed and construction is expected to start at an early date.

ROANOKE, VA.—The Citizens' Crystal Ice Co. has let a contract to John F. Barbour & Sons, Roanoke, for a 50 x 90-foot fireproof building to cost about $20,000, and a 68 x 120-foot structure to cost about $60,000. Bids have been received for refrigerating machinery, which will be installed at an early date. Plans have also been prepared by George W. Hutchinson for a brick, steel and concrete storehouse to be equipped with automatic elevator handling equipment.

BRYSON CITY, N. C.—The commissioners of Swain county will erect the following bridges: A 250-foot concrete bridge at DeHart's mill; a 150-foot bridge over Ocan Lufty of four spans, and six single-span bridges over Alarka creek.

HAMLET, N. C.—The Seaboard Air Line railroad, W. D. Faucette, chief engineer, Norfolk, Va., has let a contract to C. V. York, Tucker building, Raleigh, N. C., for seven shop buildings including blacksmith, car repair and machine shops, stencil building, storehouse, air brake office and wheel and axle shops.

WILMINGTON, N. C.—The B. H. Stevens Co. has been incorporated to carry on business as an engineer; $5,000 capital stock; by R. C. McCarle, E. O. Penney and B. H. Stevens.

ORANGEBURG, S. C.—The Reliance Construction Co. has been incorporated to carry on business as construction engineer; $10,000 capital stock; by W. C. Wolce, C. J. Field and J. A. Berry.

ATLANTA, GA.—The Southern railroad, W. H. Wells, chief engineer of construction, Washington, D. C., contemplates the construction of a $40,000 bridge.

COLUMBUS, GA.—The Columbus Power Co. contemplates the installation of three 1,333-kilowatt, 13,200/66,000-volt, step-up transformers at Goat Rock station; a 750-kilowatt motor-generator set and exciter in station No. 4 for street car service, and several 1,000-kilowatt-volt-ampere synchronous condensers for power correction at Hogansville, Ga.

BONIFAY, FLA.—An election to determine a bond issue will be held March 21 for the erection of a $25,000 bridge.

PENSACOLA.—The Newport Turpentine & Rosin Co., 1120 First National Bank building, Milwaukee, owned by the Ferdinand Schlesinger interests, and operating a large naval stores works at Bay Minette, Ala., is preparing to invest $100,000 in a second plant, to be located at Pensacola. Construction will begin at once and it is planned to start operations late in October. Ferdinand Schlesinger will superintend preliminary work.

PLANT CITY, FLA.—The city of Plant City contemplates the construction of an electric light plant to cost about $50,000. Address the board of public works.

FLORENCE, ALA.—The city of Florence has retained Knight & Quale, Chattanooga, Tenn., to prepare plans for a filtration plant. C. E. Jordan is the commissioner of public works. A bond issue of $210,000 has been successfully floated and work will be started shortly.

JACKSON, ALA.—A company will be incorporated by L. C. Irvine, W. D. Harrigan, Frank Boykin and others, all of Mobile, Ala., to build a $50,000 bridge over the Tombigbee river.

KNOXVILLE, TENN.—The Atlantic Ice & Coal Corporation, Atlanta, Ga., has had plans prepared and will build an ice and cold storage plant of brick and steel construction, six stories, on a site 100 x 170 feet. The estimated cost of construction is $100,000.

MEMPHIS, TENN. — The Thomson Mfg. Co. has been incorporated to build and deal in machinery; $5,000 capital stock; by William H. Thompson, Alfred D. Mason, George H. Russell, Harry H. Magnum and S. F. Teter.

MEMPHIS, TENN.—The Hoshall Machinery Co., Bank of Commerce and Trust building, is in the market for two 100-kilowatt direct current, 125-volt generators, and two 75-kilowatt, direct current 250-volt generators, all connected to engines.

NASHVILLE, TENN.—The Street Electric Co. has been incorporated; $10,000 capital stock by R. A. Street, W. C. Tupper, W. S. Counsell and others.

ROCKWOOD, TENN.—The Rockwood Machinery Co. has been incorporated to continue the operation of the company by that name, to do general repairing and to furnish small foundry products. Among those interested are: E. W. Morris, L. G. McClen, F. H. Clymer and others. Tentative plans have been prepared for the installation of equipment for the manufacture of heavy foundry products.

ASHLAND, KY.—The Ashland Iron & Mining Co. has announced that it will build a steel plant. Plans call for a 36-inch blooming mill, three 75-ton open hearth furnaces, two soaking pits, and auxiliary equipment. All machinery will be motor-driven.

LOUISVILLE, KY.—Plans for doubling the capacity of their dimension mill, are being considered by C. C. Mengel & Bros., according to best information obtainable. It is likely that all machinery will be electrically driven.

PRINCETON, KY.—The franchise for electric light and power in Caldwell county outside of the city of Princeton has been purchased by the Princeton Electric Light & Power Co.

ARGENTA, ARK. — The Argenta Foundry Co., recently incorporated, has started operating a foundry which was completely overhauled and partially reconstructed. The company manufactures sash weights. S. A. Sullivan is one of the owners.

GLENWOOD, ARK.—The A. L. Clark Lumber Co. is planning to build 18 miles of railroad connecting with the Chicago, Rock Island & Pacific railroad at Plainview.

HOT SPRINGS, ARK.—The Hot Springs, Pine Bluff & Mississippi railroad recently organized with $3,500,000 capital stock, has made surveys and will proceed to build a 170-mile line from Hot Springs to Fair. J. F. Loughborough of Little Rock and W. W. Brown of Nashville, Ark., president of the Memphis, Dallas & Gulf railroad, are interested.

MONTICELLO, ARK.—The Monticello Iron Works, W. C. Byington, president, has leased a building and will install equipment for a machine shop.

LAKE CHARLES, LA.—The city of Lake Charles has decided to construct a municipal water works system. E. L. Gorham is the city engineer.

BALLINGER, TEX. — The Ballinger Electric Light & Power Co. has been incorporated; $50,000 capital stock; by R. H. Irvine, M. F. Treadwell and W. G. Fricke.

BATSON, TEX.—The electric light plant and machine shop owned by Thompson & Bietrich were seriously damaged by fire causing a loss of about $25,000.

DALLAS, TEX. — The Texas Structural Steel Co. has been incorporated; $3,000 capital stock; by Jacob Brillhart, T. J. Mosher and W. S. Mosher.

DALLAS, TEX. — W. E. Hulse & Co., Hutchinson, Kas., architects, are preparing plans and specifications for a 300-foot bridge to cost $25,000, over the Brazos river for the Dallas & Southwestern Motorway Co.

HOUSTON, TEX.—The Parkersburg Tank Co has been incorporated; $14,000 capital stock; by J. F. Tucker, B. E. Byrne and John T. Crotty.

RICHMOND, TEX.—Fort Bend county will vote on a $20,000 bond issue March 6 for the construction of a bridge over Big Creek. Address the county commissioners.

Fire!

A Volley of Sales Talk Into This Squadron of New Business Just Waiting to be Captured

The Imperial Oil Co., Sarnia, Ont., will purchase machinery, pumps, boilers and steel for the company's refinery at Regina, Sask.

The Braden Copper Co., 120 Broadway, New York City, is in the market for locomotive cranes to be used in developing the company's property in Chile.

The Mineral Point Zinc Co., De Pue, Ill., is constructing an oxide plant of steel and concrete and will install furnaces, ore handlers, fans and other equipment.

The Canadian Pacific railroad, Montreal, will install a 50-ton electric crane at its plant at Burard Inlet, Vancouver, B. C.

The Medicine Hat Pump & Brass Mfg. Co., Medicine Hat, Alta., is in the market for a universal milling machine as well as considerable other equipment.

The Edgemont Machine Co., Cincinnati, is in the market for equipment for use in building transmission machinery.

The Chile Exploration Co., 120 Broadway, New York City, is in the market for locomotive cranes to be shipped to Chile.

D. Beaubien, 28 Royal Insurance Co. building, Montreal, Que., is receiving bids for the installation of a 500-horsepower power plant, one vertical water wheel, one generator, one switchboard and considerable other equipment for the Portneuf Hydro-Electric Co.'s plant at Portneuf.

Western and Intermountain Territory

GEUDA SPRINGS, KAS.—An election will be held soon to vote on issuing $35,000 in bonds for a water and sewer system. The Benham Engineering Co., Oklahoma City, Okla., is the engineer.

OSKALOOSA, KAS. — The city council is considering construction of a municipal water works.

WICHITA, KAS. — The Western Iron & Foundry Co. will build a 1-story reinforced concrete plant costing $4,000.

WICHITA, KAS.—The Wichita Railway & Light Co., A. M. Patten, general manager, Topeka, will build a $50,000 steel bridge over the Arkansas river.

KEARNEY, NEB.—Plans have been approved for a bridge over the Platte river at Kearney, of steel and concrete, to cost $50,000. Plans are being prepared by the state engineering department, Lincoln, Neb.

FOREST CITY, S. D. — Bids will be received until April 4 by E. E. Twomey, county auditor, for galvanized iron culverts.

LAKE NORDEN, S. D.—The city council of Lake Norden is considering the construction of a municipal electric light plant and water works.

FARGO, N. D.—The Johnson Heating Co., First National Bank building, will build a factory to manufacture vacuum furnaces.

BILLINGS, MONT.—Ernst B. Joyce, Billings, states that a number of capitalists will construct a large packing plant in Billings. The capitalization is $1,000,000 and the plant will cost about $500,000.

HAMILTON, MONT.—An election will be held in April on issuing $70,000 in bonds for a water works system. Sawyer Bros., Spokane, Wash., are the engineers and George A. Ruse is the city clerk.

LIVINGSTONE, MONT.—In a recent issue of *The Iron Trade Review* it was stated that C. H. Schutte would shortly commence the erection of a foundry in Butte, Mont. C. H. Schutte advises that the foundry, which is being erected, is at Livingstone, Mont., instead of Butte.

SUPERIOR, MONT.—An election will be held this month to authorize two 225-foot span steel bridges to cost $28,500, and on a 140 and 175-foot steel bridge costing $18,500. Ray B. Lieb is the county surveyor in charge of the work.

KARLSBAD, N. M.—The Public Utilities Co. will install new machinery at the electric light and waterworks plant at a cost of $10,000. A. J. Muzzy, is president.

HOLBROOK, ARIZ. — The county will construct nine steel bridges this year, from one to four spans each, at a cost of $63,000. C. E. Perkins is county engineer.

BOISE, IDA.—L. O. Leonard, president of the Butte, Boise & San Francisco railroad, has made the announcement that a complete right of way to San Francisco has been secured and that the company has prepared its plans, which includes double-tracking for 32 miles out of San Francisco.

HAILEY, IDA. — The Mountain States Telephone & Telegraph Co. has appropriated $987,000 for improvements to be made during 1916 in Montana, Utah, Wyoming and Idaho.

LEWISTON, IDA.—G. W. Burroughs, vice president of the Lewiston-Clarkston Transit Co., announces that arrangements have been completed for considerable extensions to the electric system both east and west.

WALLACE, IDA.—A 200-ton capacity mill will be erected at the Hypothek mine and an electric double drum hoist and tramway will be installed, after plans prepared by the Hypothek Mining Co., Wallace.

Pacific Coast and Western Canada

OAKLAND, CAL.—The Moore & Scott Iron Works will build a 2-story plant on Adeline street.

OAK HARBOR, WASH.—A franchise has been granted the Whidby Island Electric & Power Co. for the completion of a lighting and water system.

SEATTLE, WASH.—United States Steel Products Co., Seattle, submitted the low bid of $12,091.40 for the steel retaining gates for the regulating dam, Lake Washington canal.

TACOMA, WASH.—The Northern Pacific railroad contemplates the early extension of its Sunnyside, Wash., branch from Grandview to Gibson, seven miles; the Simcoe branch from Harrah to White Swan 10½ miles, and the Cowiche valley branch a distance of 1½ miles.

WALLA WALLA, WASH. — The Pacific Power & Light Co. plans the reconstruction of substation at Sunnyside, in the spring.

WENATCHEE, WASH. — J. W. Quigg, Wenatchee, has been awarded a contract for constructing a 500-foot steel bridge over the Wenatchee river at $38,945.

WENATCHEE, WASH. — The engineering department of the Great Northern railroad is preparing plans for the proposed Columbia river bridge near Rock island.

WENATCHEE, WASH.—The Holden Gold & Copper Mining Co. has bonded its group of claims at the head of Lake Chelan. Harry Holden, general manager, states that the plans include the equipment of the mine with a larger compressor and the ultimate construction of a railroad to the smelter.

PORTLAND, ORE.—The plant of the York Electric Steel Co., Twenty-fourth street and York street, was damaged by fire recently with a loss of $15,000. Leonard Schad is manager.

PORTLAND, ORE. — Hans Pederson, Seattle, has been awarded a general contract on his bid of $317,400 for constructing the Portland auditorium. This includes furnishing materials, masonry, sheet metal work, steel and iron work, miscellaneous metal work, etc.

SALEM, ORE.—State Engineer Lewis will prepare plans and specifications for the Marion-Polk county bridge. Joseph Weare, Portland, will be bridge engineer for the highway department. The structure is to cost about $250,000.

YONCALLA, ORE. — An election will be held April 17 on issuing $20,000 in bonds for the construction of a waterworks plant.

EDMONTON, ALTA.—The Emery Mfg. Co. will rebuild its factory which was damaged by fire with a loss of $100,000. A. E. Emery is the president.

New Business in Eastern Canada

WINNIPEG, MAN.—The T. Eaton Co., department store, has submitted plans for the erection of a main building and a warehouse each 12 stories, at an estimated cost of $3,000,000. If the necessary steel can be secured work will be started in the spring.

CAMPBELLFORD, ONT.—The Northumberland Paper & Electric Co.'s plant was damaged by fire.

EAST ANGUS, ONT.—The town council will build a steel and concrete bridge to cost $37,000. R. C. Cowling is clerk of the council.

GUELPH, ONT.—The Lauden Machine Co. will build a $20,000 addition to its plant.

GUELPH, ONT.—The Callander Foundry & Mfg. Co. has been incorporated to carry on business as general founder and manufacturer; $40,000 capital stock; by John M. Ferguson, Joseph P. Walsh and Alexander C. Rutherford, all of Toronto.

HAMILTON, ONT. — The Steel Co. of Canada has bought the plant of the Gananogue Bolt Co., Gananoque, Ont., and will install drop forge equipment.

HESPELER, ONT.—A. B. Jardine Co.'s shell manufacturing plant which was recently damaged by fire with a loss of $60,000 will be rebuilt. Considerable machinery will be required to replace that which was injured.

LONDON, ONT.—The London Gas Power Co. has been incorporated to build machinery, munition Machinery Co. has been incorporated tools, etc.; $100,000 capital stock; by James W. G. Winnett, William H. Heard, Charles A. Bowman and others all of London.

MARKHAM, ONT. — The Hall Motor Co. has secured a building and will install machinery for the manufacture of automobiles, motor trucks, machinery, etc. The manager is E. A. Hall.

NIAGARA FALLS, ONT.—The Ontario Transmission Co., and the Ontario Power Co., will build extensions to their plants during the next two years to cost about $3,000,000.

OWEN SOUND, ONT.—The steel works built at Owen Sound but never operated by the Cramp Steel Co., has been taken over by William Kennedy & Sons, manufacturers of waterpower machinery and steel castings, etc., and will be utilized in the production of steel for ammunition and other purposes. The two 15-ton open hearth steel furnaces are being remodeled and enlarged.

New Trade Publications

GRINDING AND POLISHING MACHINE. —An automatic grinding and polishing machine, manufactured by the Excelsior Tool & Machine Co., East St. Louis, Ill., is described in a recent pamphlet. This machine is belt-driven. It is adapted particularly for grinding, surfacing or polishing flat, semi-flat or oval shaped castings, metal plates and pipe. The machine is illustrated and described in detail.

NUT LOCK. — Schum Bros., Metropolitan Tower, New York, have issued a circular describing an improved nut lock. The bolt is broached and provided with a sliding element which moves the threads in and out of alignment, locking and unlocking the nut automatically. No moving parts are exposed to the elements and it is said that the nut retains its tensile, bending and shearing strength. The threads when locked are kept out of alignment by a small spring.

PRESSES. — The United Engineering & Foundry Co., Pittsburgh, describes its line of straightening presses in a recent, illustrated booklet. The machines described include horizontal straightening presses for structural mills; rail and pipe straightening presses. A short discussion is given of the principles of the straightening press, together with a valuable table which will assist operators in determining what material can be handled in any given straightening press.

WEIGHING SCALES.—The Standard Scale & Supply Co., Pittsburgh, has published a 128-page catalog, devoted to its line of commercial weighing scales, among which are many types especially designed for use in various branches of the iron and steel industry. These scales include blast furnace, foundry, coal, iron dealers', rolling mill, pig iron and tin plate weighing devices. The company's scales are adapted to a great number of uses, with an equal variety of sizes and capacities.

ELECTRIC VIBRATORS. — The Magnetic Mfg. Co., Milwaukee, has issued a 16-page bulletin devoted to electric vibrators for use in foundries. Illustrations are presented showing vibrators for rapping patterns and molds. Various types of this device are made for use on benches, squeezers, heavy molding machines and pattern plates. The arrangement of the generators and attachments is explained and diagrams are given showing the method of wiring to accommodate several vibrators.

AIR HOISTS.—A new catalog, describing various types of air hoists, has been issued by the Whiting Foundry Equipment Co., Harvey, Ill. Both vertical and horizontal hoists are shown in various sizes with cylinder diameters from 3½ up to 24 inches. An automatic valve which closes when the main valve is shut off, thus sustaining the load at a given point for an indefinite length of time is prominently mentioned in the catalog. Air jacks, turntables, air receivers and hose trolleys are briefly described. The descriptive text is accompanied by illustrations.

PULLEY-GRIP.—A chemical preparation of this name, manufactured by the Pulley-Grip Co., Milwaukee, is described in a recent eight-page folder issued by that company. This substance when applied to wood, metal, fibre or composition pulley surfaces is claimed to increase the power transmission by eliminating belt slippage. Among other advantages claimed for it are the saving of most of the power lost through fiction; increasing the power without using larger belts or pulleys; removing grease, oil and other foreign deposits. This preparation is said to increase the adhesion between pulleys and belts and to enlarge the arc of contact.

DRILLS.—The Chicago Pneumatic Tool Co., Chicago, describes its electric hammer drill in a recent four-page folder. The uses to which this tool is adapted are explained. The drill is particularly suitable for drilling stone and concrete and for light chipping. It is equipped with a motor and operates interchangeably on either direct or alternating current.

ELEVATORS AND CONVEYORS. — The Link-Belt Co., Chicago, has issued an 80-page catalog describing in considerable detail, its line of elevators, conveyors and machinery. for handling, preparing and storing gravel, stone and sand. The demand for crushed stone, washed sand and gravel, clean sized slag and other prepared abrasive products, has brought about the development of special machinery for handling and preparing these materials. The machinery illustrated in this catalog are typical installations of the Link-Belt Co's machinery. Numerous cross sections and views are presented giving a clear conception of the design and operation of these machines. A large number of views are shown of the apparatus in operation.

PUMPS.—The line of centrifugal pumps designed and built by the Dayton-Dick Co., Quincy, Ill., is illustrated and described at length in a recent catalog. Among the advantages claimed for these pumps are: Ring oiling bearings are separate from the casting; the pumps are hydraulically balanced against the end thrust; all parts are readily accessible by removing the top casing; shaft is provided with sleeves extending through the stuffing boxes. The catalog illustrates these pumps in service, complete descriptions being given of their design and manufacture. The catalog also describes the company's pumps for automatic bilge service, automatic receiver service, and its portable pumping units, both of vertical and horizontal construction. A number of useful tables are given.

BALE PRESSES.—The Standard Pressed Steel Co. of Ohio, Cleveland, has issued an attractive catalog describing its bale press for handling iron and steel sheet scrap. This company devotes its entire attention to manufacturing this machine. Steel castings are used in place of gray iron castings and it is claimed that breakage has been reduced to a minimum. These machines can press five to 10 tons per day. One man can operate a machine. The opening in which the scrap is placed, measures 16 x 42 x 26 inches, permitting the handling of large, bulky sheet scrap. This bale press has a maximum crushing power of 200,000 pounds. The bales are less than 16 inches square and weigh from 150 to 400 pounds. The presses will bale scrap, No. 10 gage and lighter.

WELDING AND CUTTING APPARATUS.—The Bishop-Babcock-Becker Co., Cleveland, has just issued a new edition of its catalog describing its oxy-acetylene welding and cutting apparatus. The company's diaphragm safety device is illustrated and described in detail. This device is positive acting and automatically relieves any excess pressure in the valve which may be caused by cracking, creeping or destruction of the seat; by the deposition of iron rust from the oxygen cylinder; or by carelessness of the operater. Phosphor-bronze diaphragms are used for the oxygen regulators and silver diaphragms for the acetylene. In addition, the catalog describes the company's complete line of oxygen and acetylene welding and cutting regulators, pressure gages, welding and cutting torches, valves and decarbonizing devices.

CUPOLAS.—Catalog No. 95 issued by the Whiting Foundry Equipment Co., Harvey, Ill., has been superseded by catalog No. 118 descriptive of the cupolas manufactured by this company. The new edition was prepared to show the improvements recently developed in the design of the tuyere system, slag spout, lining supports, cleaning doors, and peep hole frames, and in the arrangement of the blast-pipe nozzle entrance to the air chamber. The cupola is described in detail by means of diagrams and illustrations and noteworthy installations of the company's equipment are shown. A number of unusual records in rapid continuous melting made by firms using this type of cupola are mentioned and testimonials from well known users of the foundry equipment are reproduced. Several pages of the catalog are devoted to charging machines and cars.

BRASS AND COPPER.—The U. T. Hungerford Brass & Copper Co., New York, has issued a 400-page, cloth-bound catalog, illustrating with great completeness, its line of brass and copper products. The contents are classified in separate departments, facilitating the ready location of any product. The lists show material aggregating more than 5,000,000 pounds, which is carried in stock. This material includes copper and brass sheets, rolls, rods and wire, seamless brass and copper tubes, condenser tubes, tobin bronze and yellow metal rods, brazed brass and bronze tubes, German silver, phosphor and commercial bronze, copper rivets and burs, braziers, rivets, copper nails and tacks, soldering coppers, solder, brass and iron chain, brass and copper wire cloth, brass and bronze railings and fittings, and many other products. A section is devoted to tables which will prove of value to the users of brass and copper products.

CONSTRUCTION WORK. — A very profusely illustrated and handsomely printed 48-page portfolio of structures fabricated and erected by the McClintic-Marshall Co., Pittsburgh, has recently been issued by this concern. This portfolio illustrates and describes briefly a great variety of structures and includes practically every form of fabricated steel work from huge lock gates, specially designed for the Panama canal, to the simpler types of mill buildings. Among the more striking illustrations in the portfolio are an interior of an open hearth building at the Donora, Pa., plant of the Carnegie Steel Co.; a Hoover & Mason ore bridge at the works of the Bethlehem Steel Co.; the Chalmette Works of the American Sugar Refining Co., containing 17,000 tons of steel; the Chelsea pier sheds, New York City; the New York Central cantilever bridge over the Ohio river at Beaver, Pa.; and the machine and erecting shops of the Baldwin Locomotive Co., Eddystone, Pa., which contain 16,000 tons of steel work and were erected complete within three months from date of contract.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Higher price to July 1; lower to Jan. 1.)

Bessemer, valley	$20.00 to 20.50
Bessemer, Pittsburgh	20.95 to 21.45
Basic, Pittsburgh	18.70 to 18.95
Basic, eastern Pa.	19.50 to 19.75
Basic, Buffalo	20.00
Malleable, Pittsburgh	19.45 to 19.95
Malleable foundry, Chicago	19.00
Malleable foundry, Philadelphia	20.50 to 20.75
Malleable foundry, Buffalo	18.50 to 19.00
No. 1X foundry, Philadelphia	20.50 to 20.75
No. 2 foundry, Pittsburgh	19.45 to 19.95
No. 2 foundry, Cleveland	19.00
No. 2 foundry, Ironton	18.00
No. 2 foundry, Chicago	18.50
No. 2X foundry, Philadelphia	20.00 to 20.50
No. 2X foundry, N. J. tidewater	20.00 to 20.50
No. 2X foundry, Buffalo	18.50 to 19.00
No. 2 plain, Philadelphia	19.50 to 20.00
No. 2 plain, N. J. tidewater	19.50 to 20.00
No. 2 plain, Buffalo	18.00 to 18.50
No. 2 southern, Birmingham	15.00 to 15.50
No. 2 southern, Cincinnati	17.40 to 17.90
No. 2 southern, Chicago	19.00 to 19.50
No. 2 southern, Phila. delivery	20.00 to 20.50
No. 2 southern, Cleveland	19.00 to 19.50
No. 2 southern, New York docks	19.00 to 19.50
No. 2 southern, Boston docks	19.25 to 19.75
No. 2 south. interior, New Eng.	20.00 to 21.00
No. 2 southern, St. Louis	18.40 to 18.90
Virginia No. 2X furnace	18.00
Virginia 2X, Philadelphia	20.75
Virginia 2X, Jersey City	21.00
Virginia 2X, Boston points	21.25
Gray forge, eastern Pa.	18.50 to 19.00
Gray forge, Pittsburgh	18.45 to 18.95
Gray forge, Birmingham	14.00 to 15.00
Silveries, 8 per cent, Jackson, O.	27.00
Silveries, 8 per cent, Chicago	29.50
Low phos. Standard, Phila.	32.00
Low phos. Lebanon, Pa.	29.00 to 31.00
Low phos. Pittsburgh	30.00 to 31.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	19.75 to 22.25
Charcoal, Buffalo	19.00 to 20.00
Charcoal, Birmingham	21.50

IRON ORE

Lake Superior Ores.

(Lower Lake Ports.)

Old range Bessemer, 55 per cent, ton	$4.45
Mesabi Bessemer, 55 per cent, ton	4.20
Old range non-Bes., 51½ per cent, ton	3.70
Mesabi non-Bess., 51½ per cent, ton	3.55

Eastern Ores.

(Per unit delivered eastern Pennsylvania.)

Pt. Henry fur., 60 per cent, unit.	8.6c to 8.9c
Local N. Y. and N. J. ores, unit.	8.5c to 8.75c
Port Henry lump, at mines, ton	$4.00

Foreign Ores.

(Per unit Philadelphia.)

(Prices nominal.)

Foreign Bess., 50 to 65 per cent	8 to 8½
For'n non-Bess., 50 to 65 per cent	8 to 8½

COKE

(At the ovens.)

Connellsville furnace	$3.50 to 3.75
Connellsville fur., contract	2.50 to 3.00
Connellsville foundry	3.75 to 4.00
Connellsville fdy. contract	3.75 to 4.00
Wise county furnace, contract	2.85 to 3.25
Wise county foundry, contract	3.25 to 3.75
Pocahontas foundry, contract	3.15 to 3.50
Pocahontas furnace, contract	2.85 to 3.25
New River, foundry contract	3.50 to 4.00
New River, furnace contract	3.00 to 3.25

FERRO ALLOYS AND STEEL MAKING METALS

Ferro mang., delivered (prompt).	$225 to 250
Ferro mang., Balti., (future)	150
Spiegelensen 20 per cent, furnace	50.00
Ferro-silicon, 50 per cent, Phila.	83.00 to 85.00
Ferro silicon, 50 per cent, Pbgh.	83.00 to 85.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $30.00; 10 to 11 per cent, $31.00; 11 to 12 per cent, $32.00; 12 to 13 per cent, $33.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, 4 to 6 per cent carbon, 25 cents per pound; 2 per cent carbon, nominal.

Ferro-vanadium, nominal, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, nominal.

Ferro-tungsten, nominal.

Cobalt metal, nominal, Pittsburgh.

Aluminum, nominal, Pittsburgh.

Ferry-molybdenum, Pittsburgh, nominal.

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive for insurance and dockage.

From New York	$0.40
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$42.00 to 45.00
Bessemer billets, Phila.	36.00 to 38.00
Forging billets, Phila.	55.00 to 60.00
Forging billets, Pbgh ,nominal).	55.00 to 60.00
Forging billets, Chgo.	55.00 to 60.00
Wire rods, Pittsburgh (nom.)	50.00 to 60.00
Bessemer billets, Youngstown	38.00 to 40.00
Bessemer billets, Pittsburgh	38.00 to 40.00
Open hearth billets, Pittsburgh.	38.00 to 40.00
Open hearth billets, Youngstown	38.00 to 40.00
Bess. sheet bars, Youngstown	38.00 to 40.00
Op. h'th sheet bars, Youngstown	38.00 to 40.00
Bess. sheet bars, Pittsburgh	40.00
Open h'th sh. bars, Pbgh.	40.00
Muck bar, Pittsburgh (nominal).	40.00

SKELP

Grooved steel skelp	2.25c
Sheared steel skelp	2.35c

RAILS AND TRACK MATERIAL

Stand. Bess. rails, Pbgh. & Chg.	1.25c
Stan. op-h'th rails, Pbgh. & Chg.	1.34c
Light rails, 8 to 10 lbs., Pbgh.	1.85c
Light rails, 8 lb., Chgo.	1.76c
Light rails, 12 to 14 lbs., Pbgh.	1.80c
Light rails, 12 lbs., Chgo.	1.71c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—

Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18

Buffalo to:—

Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Broklyn (by canal)	1.25 to 1.60

Virginia furnaces to:—

Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88

Birmingham, Ala., to:—

Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75

Chicago to:—

Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58

Ironton and Jackson, O., to:—

Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails 16 to 20 lbs., Pbgh.	1.75c
Light rails 16 to 20 lbs., Chgo.	1.66c
Light rails 25 to 45 lbs., Pbgh.	1.70c
Light rails 25 to 45 lbs., Chgo.	1.61c
Relaying rails, standard, Pbgh. and Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect., Pbgh., base	1.50c to 1.75c
Angel bars, st. sections, Chgo.	1.50c to 1.75c
Spikes, railroad, Pbgh.	2.50c
Spikes, railroad, Chgo.	2.60c to 2.75c
Track bolts, Pbgh.	3.25c
Track bolts, Chgo.	3.00c to 3.25c
Tie plates, Chgo.	45.00 to 48.00

SHAPES, PLATES AND BARS

Structural shapes, Pbgh.	2.50c
Structural shapes, Pbgh. (con.)	2.25c to 2.50c
Structural shapes, Chgo.	2.44c to 2.69c
Structural shapes, Philadelphia	2.409c to 2.659c
Structural shapes, New York	2.419c to 2.669c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chgo.	2.54c to 3.19c
Tank plates, Pbgh. (con.)	2.35c to 2.60c
Tank plates, Pbgh.	2.75c to 3.25c
Tank plates, Philadelphia	2.509c to 3.159c
Tank plates, New York	2.519c to 3.169c
Bars, soft steel, Pbgh.	2.25c to 2.50c
Bars, soft steel, Chgo.	2.44c to 2.69c
Bars, soft steel, Pbgh. (con.)	2.00c to 2.25c
Bars, soft steel, Pbgh.	2.50c
Bars, soft steel, New York	2.419c
Hoops, carloads, Pbgh.	2.50c
Bands, Pittsburgh	2.25c
Shafting, Pbgh., contr. carloads	30 to 35 off
Bar iron, Chgo.	2.00c to 2.10c
Bar iron, Philadelphia	2.559c
Bar iron, New York	2.569c
Bar iron, Cleveland	2.25c
Bar iron, Pittsburgh	2.40c to 2.50c
Hard steel bars, Chgo.	2.25c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	2.60c to 2.75c
No. 28, black, Chgo.	2.94c
No. 28, tin mill, black, Pbgh.	2.50c
No. 28, galvanized, Pbgh.	4.75c to 5.25c
No. 28, galvanized, Chgo.	5.19c
No. 10, blue anl'd, Pbgh.	2.65c to 3.00c
No. 10, blue anl'd, Phila.	2.759c to 3.159c
No. 10, blue anl'd, Chgo.	2.94c
Tin plate, 100 lb., coke base	$4.00

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickl'd, cold roll. and re-anld.	30 cents
Hot roll'd pickled and anl., tin mill.	25 cents
Full pickled, cold rolled and re-anld.	50 cents
Auto sheets	75 cents
Blue stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxiding	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free fr. mill scale	55 cents
Special open hearth deep stpg. steel, free from mill scale	80 cents
Extra deep special auto body stock.	1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black.	Galv.
	Butt-weld.	
Steel ¾ to 3 inches	74	58½
Iron, ¾ to 1½ inches	61	42
	Lap-weld.	
Steel, 2½ to 6 inches	76	61½

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	63
Iron, 3½ to 4½ inches, l. c. l.	52

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$2.30
Plain wire, jobbers, Pittsburgh	2.15
Galvanized wire, jobbers', Pbgh.	2.85
Polished staples, Pbgh.	2.45
Galvanized staples, Pbgh.	3.15
Barb wire, painted, jobbers', Pbgh.	2.45
Barb wire, galv., jobbers', Pbgh.	3.15

IRON AND STEEL PRICES

Corrected up to Tuesday noon

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled thread, 65 and 5, cut threads 65; larger or longer, 50 and 15.

Machine bolts with hot pressed nuts, ⅜ x 4 inches, smaller or shorter, rolled 65 and 10; cut, 65 and 5; larger or longer, 50 and 20.

Cold pressed, semi-finished hexagon nuts, 75 and 10.

Gimlet and cone point lag bolts, 65, 10 and 5. Hot pressed square, blank or tapped nuts, $3.70 off list; hot pressed hexagon blank or tapped, $3.80.

Cold pressed square, blank or tapped, $3.50 off; hexagon, blank or tapped, all sizes, $4.25.

RIVETS

Structural rivets, Pbgh	3.00c
Structural rivets, Chgo. delivery	3.10c
Boiler rivets, Pbgh	2.91c
Boiler rivets, Chgo. delivery	3.00c

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	2.25c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil	4.50c

COLD ROLLED STRIP STEEL

Base price $5.00 to $5.25 per 100 pounds, hard, coils 1½ inches and wider and by .100 inches and heavier.

Extras.

.10 to .19 carbon. 1½ inches and wider.

Coils.

	Hard.	Soft.
0.100 and heavier	Base	$0.25
0.050 to 0.099	$0.05	0.30
0.035 to 0.049	0.20	0.45
0.031 to 0.034	0.35	0.75
0.025 to 0.030	0.45	0.85
0.020 to 0.024	0.55	0.95
0.017 to 0.019	1.35	1.35
0.015 to 0.016	1.75	1.75
0.013 to 0.014	2.45	2.45
0.012	2.80	2.80
0.011	3.15	3.15
0.010	3.50	3.50

Lengths 24 Inches and Over.

	Hard.	Soft.
0.100 and heavier	$0.10	$0.35
0.050 to 0.099	0.20	0.45
0.035 to 0.049	0.35	0.60
0.031 to 0.034	0.60	1.00
0.025 to 0.030	0.85	1.25
0.020 to 0.024	1.05	1.45
0.017 to 0.019	2.45	2.45
0.015 to 0.016	2.85	2.85
0.013 to 0.014	3.70	3.70
0.012	4.30	4.30
0.011	4.65	4.65
0.010	5.00	5.00

Extras as per card of Jan. 1, 1916.

CAST IRON WATER PIPE

Four-inch, Chicago	$32.50 to 33.00
Six-inch and larger, Chicago	29.50 to 30.00
Six-inch Class B, New York	29.50
Four-inch, Class B, New York	32.50
Four to six-inch, Birmingham	28.00
Six-inch and larger, Birmingham	25.00

Light weight water and gas pipe, $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	2.75c
Steel squares, 2-in. & ov., Cleve.	3.50c
Steel rounds, 2-in. & ov., Cleve.	3.20c
Steel bars, under 2 in., Cleveland	3.00c
Steel bars, Philadelphia	2.60c
Steel bars, New York	2.95c
Steel bars, St. Louis	2.80c
Steel bars, Cincinnati	3.00c to 3.50c
Steel bars, St. Paul	2.85c
Steel bars, over 2-inch, Buffalo	3.65c
Steel bars, Buffalo	2.95c
Iron bars, Chicago	2.30c
Iron bars, Cleveland	2.95c
Iron bars, St. Louis	2.75c
Iron bars, Cincinnati	3.00c to 3.50c
Iron bars, Philadelphia	2.60c
Iron bars, New York	2.95c
Shapes, Chgo.	2.75c
Shapes, St. Louis	2.80c
Shapes, St. Paul	2.85c
Shapes, New York	2.95c
Shapes, Cleveland	3.00c
Shapes, Philadelphia	2.50c
Shapes, Buffalo	2.95c
Shapes and plates, Cincinnati	3.00c to 3.15c
Plates, Chgo.	2.95c
Plates, St. Louis	3.00c
Plates, St. Paul	3.05c
Plates, New York	3.50c
Plates, Cleveland	3.15c
Plates, Philadelphia	2.75c
No. 10 blue anl. sheets, Chgo.	2.95c
No. 10 blue anl. sheets, Clevel'd	3.25c
No. 10 blue anl. sheets, Buffalo.	3.25c
No. 10 blue anl. sh'ts, St. Louis	3.00c
No. 10 blue anl. sheets, Cinci.	3.25c to 3.50c
No. 10 blue anl. sheets, St. Paul	3.05c
No. 28 black sheets, Chgo.	3.00c
No. 28 black sheets, Cleveland.	2.95c
No. 28 black sheets, Cincinnati.	3.65c
No. 28 black sheets, St. Louis.	3.20c
No. 28 black sheets, St. Paul.	3.25c
No. 28 galv. sheets, Chgo.	4.80c to 5.00c
No. 28 galv. sheets, Cleveland.	5.25c
No. 28 galv. sheets, Cincinnati.	5.30c
No. 28 galvanized sheets, St. L.	5.25c to 5.50c

Freight Rates, Coke

Connellsville district, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.85
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

Arch bars and transoms, Chgo.	$18.00 to 18.50
Arch bars and transoms, St. L.	18.00 to 18.50
Angle bars, iron, Chicago	17.25 to 17.75
Angle bars, steel, St. Louis	13.50 to 14.00
Arch bars and transoms, Chgo.	18.00 to 18.50
Arch bars and transoms, St. L.	16.50 to 17.00
Cut forge, Chicago	13.75 to 14.25
Knuckles, coup., Chgo.	15.50 to 16.00
Springs, St. Louis	16.00 to 16.25
Springs, Chgo.	15.25 to 15.50
Knuckles, coup., St. L.	15.50 to 16.00
Locomotive tires, Chicago	17.00 to 17.50
Locomotive tires, St. Louis	17.00 to 17.50
Railroad wrought, No. 1, Chgo.	15.00 to 15.50
Railroad wrought, No. 1, Cleve.	18.00 to 18.50
Railroad wrought, No. 1, St. L.	14.50 to 15.00
Railroad wrought, No. 1, Cinci.	12.50 to 13.00
Railroad wrought, No. 2, Chgo.	14.00 to 14.25
Railroad wrought, No. 2, St. L.	14.00 to 14.50
Shafting, St. Louis	17.00 to 17.50
Steel car axles, Birmingham	14.50
Steel car axles, St. Louis	21.00 to 22.00
Steel car axles, Chicago	22.25 to 22.75

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—

New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul	32.9 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Boiler plate, cut, No. 1, Chgo.	11.50 to 12.00
Boiler plate, cut, No. 1, St. L.	9.50 to 10.00
Boiler punchings, Chicago	14.00 to 14.50
Busheling, No. 1, Chicago	11.75 to 12.25
Busheling, No. 1, Cleveland	14.00 to 14.50
Busheling, No. 1, Cincinnati	10.25 to 10.75
Busheling, No. 1, St. Louis	11.50 to 12.00
Busheling, No. 2, Chicago	8.75 to 9.25
Bundled sheet, Cincinnati	8.50 to 9.00
Cast, No. 1, Cleveland	13.75 to 14.25
Cast, No. 1, Cincinnati	11.50 to 12.00
Cast, No. 1, St. Louis	12.50 to 13.00
Cast No. 1, Chicago	12.50 to 13.00
Cast borings, Chicago	7.25 to 7.75
Cast borings, Cleveland	8.50 to 8.75
Cast borings, Cincinnati	7.50 to 8.00
Cast borings, St. Louis	7.00 to 7.50
Machine shop turnings, Chgo.	8.00 to 8.50
Machine shop turnings, Clevel'd.	7.25 to 7.50
Machine shop turnings, Cinci.	7.00 to 7.50
Machine shop turnings, St. L.	8.00 to 8.50
Malleable agricultural, Chgo.	12.00 to 12.50
Malleable agriculture, St. Louis.	12.50 to 13.00
Malleable railroad, Chicago	13.50 to 14.00
Malleable, Cincinnati	8.50 to 9.00
Malleable railroad, St. Louis	12.00 to 12.50
Pipes and flues, Cleve'd (nom.)	13.00 to 13.75
Pipes and flues, Chicago	11.00 to 11.50
Pipes and flues, St. Louis	10.50 to 11.00
Stove plate, Chicago	11.00 to 11.50
Stove plate, Cleveland	10.25 to 10.75
Stove plate, Buffalo	11.00 to 11.50
Stove plate, Cincinnati	8.00 to 8.50
Stove plate, St. Louis	9.50 to 10.00

(Gross tons.)

Boiler plate sheared, Buffalo	13.00 to 13.50
Busheling, No. 1, Buffalo	13.50 to 14.00
Busheling, No. 1, Pbgh	14.50 to 15.00
Busheling, No. 2, Buffalo	11.00 to 11.50
Bundled sheet, Pittsburgh	14.00 to 14.50
Bundled sheet, Cleveland	12.75 to 13.25
Bundeld sheet, Buffalo	12.00 to 12.50
Car wheels (iron), Pittsburgh	15.50 to 16.00
Car wheels (steel), Pittsburgh	18.00 to 18.50
Car wheels, Chicago	13.75 to 14.00
Car wheels, eastern Pa.	16.00 to 16.50
Car wheels, Buffalo	15.25 to 15.75
Car wheels, N. Y.	14.00 to 14.50
Car wheels, St. Louis	13.00 to 13.50
Cast borings, New York	9.00 to 9.25
Cast borings, eastern Pa.	11.00 to 11.50
Cast borings, Buffalo	9.25 to 9.75
Cast borings, Pittsburgh	11.25 to 11.50
Cast, No. 1, eastern Pa.	17.50 to 18.00
Cast, No. 1, Pittsburgh	15.50 to 16.00
Cast, heavy No. 1, N. J. points	16.50 to 17.00
Forge No. 1, eastern Pa.	14.00 to 14.50
Frogs, switches, guards, Chgo.	15.00 to 15.50
Frogs, switches, guards, St. L.	15.25 to 15.75
Grate bars, Buffalo	11.00 to 11.50
Grate bars, N. J. points	13.25 to 13.50
Heavy axle turnings, Buffalo	12.00 to 12.50
Heavy melting steel, Pbgh	17.00 to 17.50
Heavy melting steel, Buffalo	16.50 to 17.00
Heavy melting steel, Chicago	15.00 to 15.50
Heavy melting steel, Cleveland	16.25 to 16.75
Heavy melting steel, Cincinnati	13.75 to 14.25
Heavy melting steel, eastern Pa.	16.50 to 17.00
Heavy melting steel, New York	14.25 to 14.50
Heavy melting steel, St. Louis	15.25 to 15.75
Iron rails, Chicago	17.00 to 17.50
Iron rails, Buffalo	17.00 to 17.50
Iron rails, Cincinnati	14.00 to 14.50
Iron rails, St. Louis	16.00 to 16.50
Iron rails, Cleveland (nom.)	17.00 to 18.00
Iron axles, Pittsburgh	25.00 to 26.00
Iron axles, Cincinnati	20.25 to 20.75
Iron axles, eastern Pa.	26.00 to 27.00
Iron axles, Chgo.	23.50 to 24.00
Iron axles, Buffalo	23.00 to 23.50
Iron axles, St. Louis	22.25 to 22.50
Low phos. steel, Buffalo	20.50 to 21.00
Low phosphorus steel, Pbgh.	21.50 to 22.00
Low phos. steel, eastern Pa.	22.00 to 23.00
Machine shop turnings, Buffalo.	7.75 to 8.25
Mch. shop turnings, New York.	8.00 to 8.50
Mch. shop turnings, Pbgh.	9.25 to 9.75
Mch. shop turnings, eastern Pa.	9.75 to 10.25
Mall. railroad, Cleveland	16.25 to 16.50
Malleable railroad, Pittsburgh	16.25 to 16.50
Malleable railroad, Buffalo	15.25 to 15.75
Malleable railroad, eastern Pa.	14.50 to 15.00
R. R. and mch. cast, No. 1 Bfl.	15.50 to 16.00
R. R. wrought, No. 1, Buffalo	17.50 to 18.00
Railroad wrought, No. 1, E. Pa.	22.00 to 23.00
R. R. wght., No. 1, New York	20.50 to 21.00
Railroad wrought, No. 1, Pbgh.	19.00
Reroll. rails, 5 ft. & ov., Pbgh.	18.00 to 18.50
Reroll. rails, 5 ft. & ov., Chgo.	17.00 to 17.50
Reroll. rails, 5 ft. & ov., Cleve.	16.25 to 16.75
Reroll. rails, 5 ft. & ov., E. Pa.	19.00 to 20.00
Reroll. rails, 5 ft. & ov., St. L.	17.50 to 18.00
Shafting, New York	19.00 to 19.50
Shafting, eastern Pa.	22.00 to 23.00
Shoveling steel, Chicago	14.50 to 14.75
Shoveling steel, St. Louis	14.00 to 14.50
Steel rails, short, Chicago	16.50 to 17.00
Steel rails, short, Cleveland	18.25 to 18.50
Steel rails, short, St. Louis	15.25 to 15.75
Steel car axles, New York	22.00 to 23.00
Steel car axles, Buffalo	23.00 to 23.50
Steel car axles, Cleveland	24.00 to 24.50
Steel car axles, eastern Pa.	24.00 to 25.00
Stove plate, N. J. points	13.25 to 13.50
Stove plate, Pittsburgh	11.50 to 12.00
Stove plate, eastern Pa.	13.50 to 14.00
Wrought pipe, New York	13.25 to 13.50
Wrought pipe, eastern Pa.	15.25 to 15.75
Wrought pipe, eastern Pa.	14.75 to 15.25

Opportunities

POSITIONS OFFERED
Minimum ad. set solid, 50 words $1.00
Minimum ad. all caps, 50 words $1.50

POSITIONS WANTED
Minimum ad. set sold, 25 words $.50
Minimum ad. all caps, 25 words $.75

(Each additional word set solid, 2c.—Each additional word all caps, 3c.)

Positions Offered

WANTED AT ONCE, SEVERAL FIRST class draftsmen of general mill and blast furnace experience. State age, experience, present salary and salary wanted in first letter; also when available. Central location Pittsburgh. Address Box 749, THE IRON TRADE REVIEW, Cleveland, O.

WANTED AT ONCE, SEVERAL DRAFTSmen experienced in power plant and general piping work. State experience, present salary and salary wanted in first letter; also when available. Central location Pittsburgh. Address Box 750, THE IRON TRADE REVIEW, Cleveland, O.

UNDERSIGNED COUNSEL WILL CONfidentially negotiate preliminaries for important executive, technical, administrative and professional positions, insuring strictest privacy. Not an agency, but a highly-endorsed, high grade method of negotiating preliminaries only, for $2,000 to $12,000 men. Send address only for explanation. R. W. Bixby, F1 Niagara Square, Buffalo, N. Y.

WANTED: — SUPERINTENDENT FOR 3-Furnace Malleable Iron Shop. Prosperous business. Good organization. Full of work. Superintendent leaves to engage in different business. St. Louis Malleable Casting Co., 7800 N. Broadway, St. Louis, Mo.

WANTED:—FOREMAN—BENCH MOLDing Steel Castings. Must be familiar with Manganese steel castings and capable of producing nice clean work. State age, experience and salary. Address Box 784, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — 3 HEATERS. 3 YEARS foreign engagement, wages $150 per month. Address Box 788, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — STEEL BLOWER, FAMILiar with Whiting cupolas and able to handle exacting proposition. Advise experience and salary expected. Address Box 791, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — COMPETENT AND EXperienced Superintendent (Gentile) for Iron Yard in St. Louis, Mo. State experience, references and salary desired. Address Box 796 THE IRON TRADE REVIEW, Chicago, Ill.

THE BEST WAY TO GET A GOOD position in drafting or engineering is to file an application direct with some of our clients who are depending on us to get competent and experienced applicants for their vacant positions. Send stamp for blank and list of vacant positions. The Cleveland Engineering Agency Co., Rose building, Cleveland, O.

WANTED:—FOREMAN FOR FOUNDRY manufacturing harvesting machinery and plows. Must thoroughly understand mixing of iron by analysis; must also be familiar with chilling process used on plows. Applicant must be temperate in habits, of good clean character, aggressive, and above all a good executive. State age, years of experience and where present employed. All recommendations and correspondence treated confidentially. Address Box 785, THE IRON TRADE REVIEW, Cleveland, O.

Positions Offered

SHOP SUPERINTENDENT; WANTED for Ordnance Plant. Must be conversant with modern methods and equipment; also capable of operating under forced draft. Give full particulars as to experience, previous employment, age and salary expected. Applications will be treated in confidence. Address Manager, Box 176, Newark, N. J.

WANTED:—GENERAL FOREMAN FOR Machine Shop employing about 250 men. Must have experience in heavy and light work of miscellaneous character, must also be able to estimate accurately labor on work. Should be a good organizer and able to produce results. Shop located in Northern Ohio. State age, salary and experience; **also** references and where last employed. Address Box 797, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: FOUNDRY FOREMAN, CONverter shop. Must be experienced in all around molding. State age, previous experience, references and salary expected. Address Box 807, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: TO CORRESPOND WITH A thoroughly experienced man in drafting and designing gasoline traction engines. Position open for right kind of a man with a good firm in Western Canada. Address Box 806, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

BLAST FURNACE SUPERINTENDENT, competent, successful and up-to-date in furnace practice. For 10 years making Bessemer iron. Now employed at a record breaking plant making basic iron. Wishes position with a company appreciating good work. Can refer you to past and present employer. Address Box 755, THE IRON TRADE REVIEW, Cleveland, O.

AS WORKS MANAGER, GENERAL Superintendent or Systematizer of gray iron or car wheel foundry. Thoroughly posted as to cupola practice, melting by analysis; good organizer with energy; can reduce your costs and increase your output. A-1 references. Address Box 786, THE IRON TRADE REVIEW, Cleveland, O.

SALES MANAGER:—OF LONG EXPErience would like to connect with some good manufacturing concern. Capable of assuming full charge of business management. Full particulars furnished interested parties. Personal interview preferred. References, former employers and others. Address Box 793, THE IRON TRADE REVIEW, Cleveland, O.

TECHNICAL GRADUATE, SIX YEARS experience in the manufacture of steel castings, including railroad, miscellaneous and manganese track work; would like position as SUPERINTENDENT, MANAGER or SALES ENGINEER. Practical experience in every department of foundry practice and office management. Conversant with best methods and principles of Efficiency. Age 34; possessing pleasing personality with plenty of initiative and executive ability; abundance of physical and mental energy. Best of references. Address Box 805, THE IRON TRADE REVIEW, Cleveland, O.

POSITION AS BLOWER OR IRON Foreman by a blast furnaceman of good education and wide experience. Excellent references. Address Box 763, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

STRUCTURAL STEEL, ORNAMENTAL iron and reinforced concrete engineer and estimator desires engagement with a company requiring the services of an A-1 man. Address Box 795, THE IRON TRADE REVIEW, Cleveland, O.

COMPETENT BLAST FURNACE SUPERintendent, technically trained; twelve years experience in modern and efficient practice, management and operation with large plant. Thoroughly understand ores, amount of temperature, blast and material required to produce different kinds of iron. Well versed in modern practice. Desire change; investigate my record. Address Box 764, THE IRON TRADE REVIEW, Cleveland, O.

ORNAMENTAL IRON AND STRUCTUral steel man; desires connection with iron or steel works, graduate civil and mechanical engineer. Can take financial interest and devote all my time to the business. Experienced in selling and contracting for building products, bridges and reinforcing steel, competent designer and estimator. Address Box 742, THE IRON TRADE REVIEW, Cleveland, O.

FOREMAN NOW EMPLOYED, WISHES to make change; have 20 years' experience as pattern maker and foreman, draftsman and designer; last four years in charge of designing, experimental and pattern departments with a large brass firm. Thoroughly up to date on modern shop practice. Address Box 707, THE IRON TRADE REVIEW, Cleveland, Ohio.

WHEN YOU NEED A HIGH GRADE executive, engineer, draftsman, or any technical man, consult The Engineering Agency, Inc., (Est. 24 years), 1662 Monadnock Block, Chicago.

AS FOUNDRY SUPERINTENDENT OR manager; graduate in metallurgy and mix by analysis; have wide experience on loams dry and green sand in brass, bronze, steel and iron; expert on molding machines and metal plates, estimating; wood and metal patternmaking; spent 5 years as chief foundry engineer and adviser in U. S. navy yard; age 37, married; can furnish highest references. Address Box 767, THE IRON TRADE REVIEW, Cleveland, O.

WANTED — TO HEAR FROM FIRM desiring service of labor foreman, steel blower, turn foreman, converting open hearth blowing mills. Address Box 780, THE IRON TRADE REVIEW, Cleveland, O.

DRAFTSMAN 31, WITH GOOD EXPErience in design of Rolling Mills and open hearth furnaces, desires position. Machine shop experience and technical training. Address Box 782, THE IRON TRADE REVIEW, Cleveland, O.

POSITION AS CHEMIST IN STEEL mill or foundry by young man of several years experience. Will send particulars and references on request. Address Box 800, THE IRON TRADE REVIEW, Cleveland, O.

POSITION AS CHEMIST IN CLEVEland or Pittsburgh district; 7 years experience in open hearth blast furnace and crucible steel laboratories. Best of references. Address Box 801, THE IRON TRADE REVIEW, Cleveland, O.

SKELP ROLLER OF LONG EXPErience and well recommended is open for engagement on grooved rolls. Have good inventive ability and of good habits. Address Box 598, THE IRON TRADE REVIEW, Cleveland, O.